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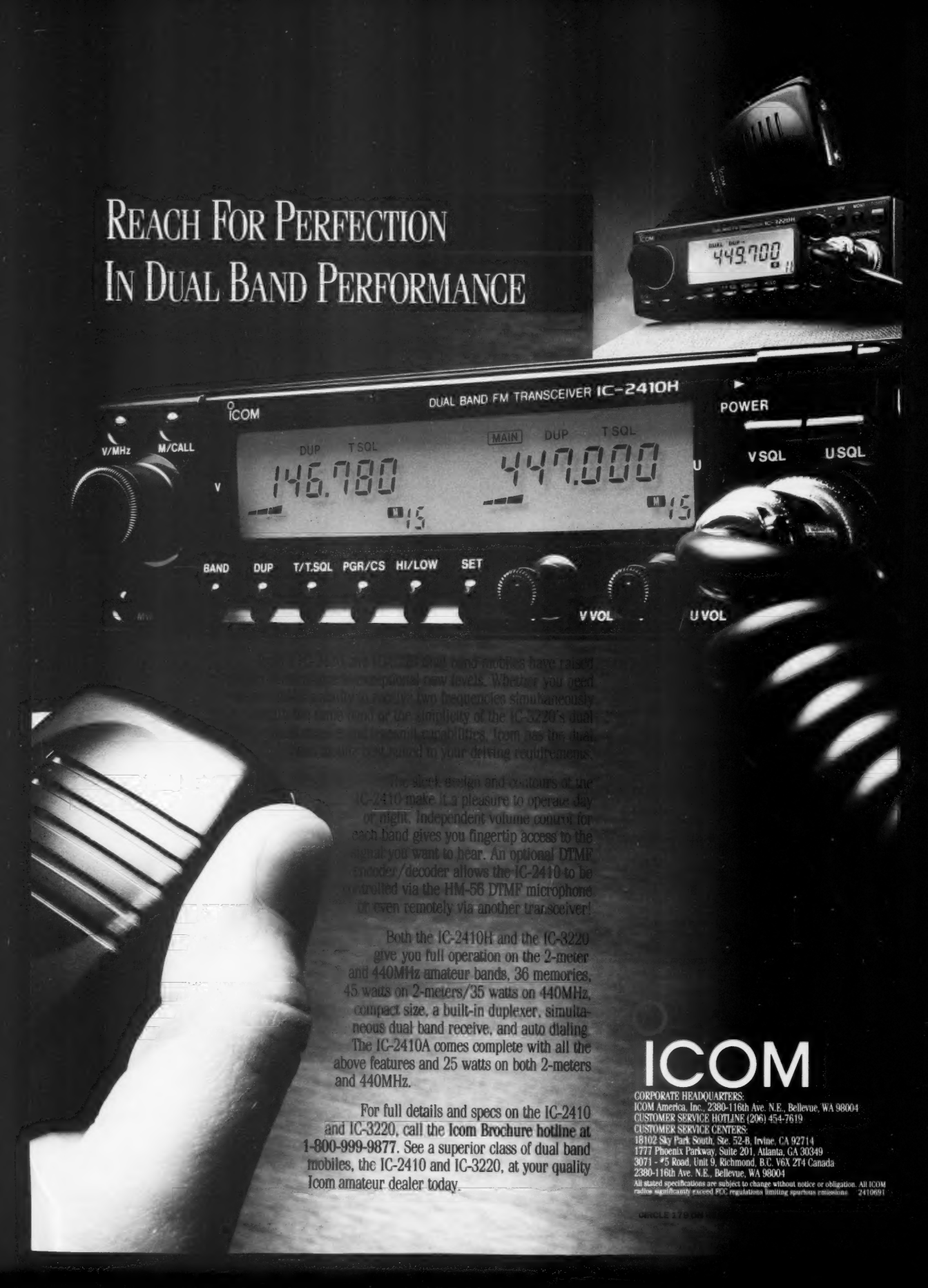
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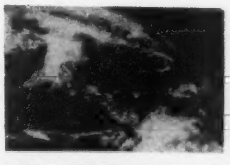

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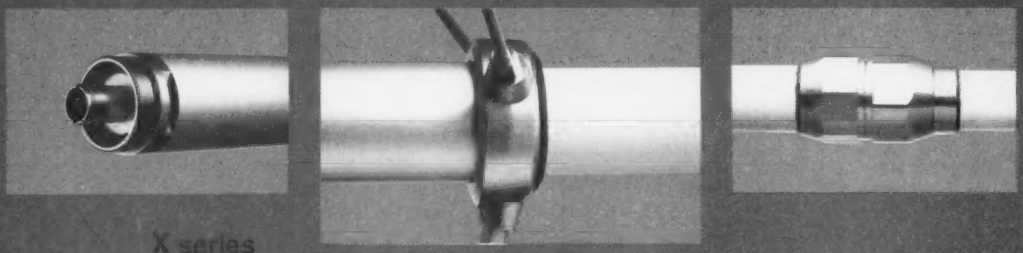

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X-500HNA DUAL BAND REPEATER VERSION

X-500NA DUAL-BAND REPEATER VERSION

X-200A DUAL-BAND REPEATER VERSION

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X-500HNA	2m/70cm	8.3/11.7	200	17.2	N	90	2m:3-5/8λ,70cm:8-5/8λ
X-500NA	2m/70cm	8.3/11.7	200	17.2	N	90	2m:3-5/8λ,70cm:8-5/8λ
X-200A	2m/70cm	6.0/8.0	200	8.3	UHF	112.5	2m:2-5/8λ,70cm:4-5/8λ
X-50A	2m/70cm	4.5/7.2	200	5.6	UHF	135	2m:6/8λ,70cm:3-5/8λ

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U-5000A

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U-5000A	2m/70cm /23cm	4.5/8.3 /11.7	150	6.0	N	135	2m:6/8λ,70cm:3-5/8λ, 23cm:7-5/8λ

F series VHF/UHF MONOBAND

F-23A

PART #	FREQ	GAIN(dB)	PWR(W)	LENGTH(FT)	CONNECTOR	WIND RATING	ELEMENT PHASING
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F-22A	2m	6.7	200	10.5	UHF	112	2-7/8λ
F-23A	2m	7.8	200	15.0	UHF	90	3-5/8λ
F-142A	1 1/4m	5.5	200	6.0	UHF	110	2-5/8λ
F-718A	70cm	11.5	250	15.0	N	90	18-1/2λ
F-1230A	23cm	13.5	100	10.5	N	90	25-1/2λ

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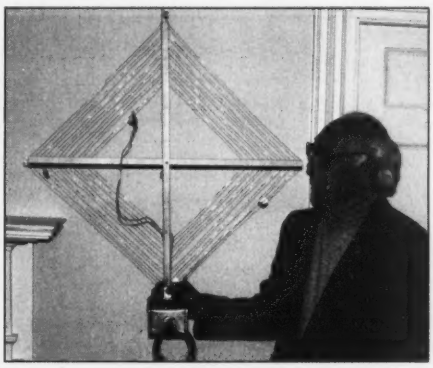

Cover design by Alice Scofield.

Cover photo by Larry Dunn.

Ever try a square pancake? . . . see page 18.

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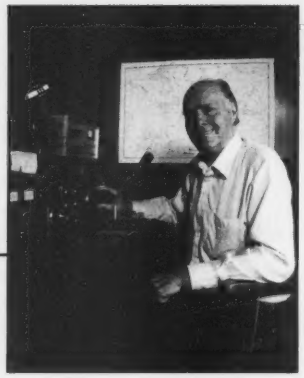

NEVER SAY DIE

Wayne Green W2NSD/1

Are You Free?

America, "the land of the free," right? We brag to the world about our freedom and we try to convince other countries to follow our leadership. Freedom of religion. Freedom of choice. Political freedom.

Hmmm, yes, to some degree. But I have a problem with my concept of freedom and the actuality of living in America. For instance, it used to bother me greatly that as a child I had so few rights. The government said I had to go to school. They didn't say here are the reasons why you'll benefit from going to school so it's a good idea and we're making it available to you. They said either you go to school or you go to prison. Now let's run through that land of the free bit again.

During WWII the government said we'd like you to fight. They didn't put it exactly that way. It was more like you have a choice of fighting or going to prison. Yes, it's a choice. So as a kid I went to school to avoid prison, not to get an education. And I went to war and was fairly directly involved with killing thousands of Japanese (they were Japs then).

All this came to mind when I got to thinking about why I've always been entrepreneurially inclined. It's that freedom thing. When I worked for others, I found I had to give up a good deal of my freedom. When you're free you hold your head up a little higher . . . and having your own business gives you much more of an opportunity to be free.

Being an entrepreneur opens up this opportunity. It also at least gives you a chance at hitting the jackpot . . . something working for others isn't likely to do. Not many entrepreneurs make it big. Indeed, very few entrepreneurs start their own businesses with the main goal of making a lot of money.

It irks me that so much of our government is devoted to taking away my freedoms . . . that so many laws limit my freedom. And I'm not talking about the freedom to go out and bop people. You may or may not enjoy the cartoons in *Playboy*, but you should at least read their regular column on government assaults on our personal freedoms.

All this came to mind when I was considering encouraging you to give entrepreneurialism a try . . . maybe in your spare time. Freedom does have its costs. You have to work for it. You have to be responsible for yourself, which is a responsibility many people will go to lengths to avoid. One good aspect of slavery is that someone else is responsible. You have to do what they say, when they say. But in exchange you normally get food, shelter and a retirement plan.

If you're interested in giving freedom a try and would enjoy working part time out of your home, I'm planning on looking for some sales and service help in your area. Selling what? Magazines and compact discs mostly.

You'll need a car and some experience in bookkeeping and selling. And you'll want to be fairly near an urban area where there are record, musical instrument, hi-fi, and book stores. I'd prefer it if you don't smoke (so you won't be sick so much of the time or drop dead just as you get your territory really cooking). I don't care how old you are, what race, color or sex. Oh yes, one more thing . . . you need to be nuts about music. I don't want to hear from people who are just looking to make a buck. I need people who will have the time of their lives and be in love with the product.

What's involved is the distribution of about 10 monthly magazines and 2,500 compact disc titles (so far). It hasn't much to do with amateur radio right now, but if we can get the ham industry growing a bit, we might be able to expand into that. The no-code license seems to be doing better than I expected, so I'm optimistic. But for now the music business is roaring along—so why not ride the faster horse? It's an $8 billion American market and growing fast . . . and I publish the leading magazines in the field.

Well, I could go on at great length, painting beautiful pictures of wealth and happiness, but I don't want to interfere with your normal depression or trigger an outburst from the totally defeated contingent who somehow blunder into my editorials.

The time was when being a rep for amateur equipment was a great job. That was back before the Great Ham Crash of 1964 when we had over 850 ham stores around the country and they were selling several times as much ham gear as today.

Heath was the last of the old-time ham equipment companies. When they stopped advertising in *73* I knew that was the beginning of the end. Remember their old Hot Water rigs? They were great little single-band SSB rigs which sold for $100! I used 'em in a number of rare countries and handled huge pile-ups. Alas, without the Japanese market, which is about five times the size of ours, it's almost impossible to stay in the ham business these days.

Well, it's your spare time, so you invest it the way you think best. If you're working for someone else and not so happy with your work that you can hardly wait to get in every morning, you might give some thought to being an entrepreneur . . . perhaps starting a small business at home in a field you enjoy.

Or you can use your time to call in on the net every night and trade jibes with friends. I did that for a couple years, so I know it's fun and kinda addicting. It's like standing around the corner with your gang . . . and about as productive. Bill and Olga, Homer, Leo and I had a great time on 75m.

Well, in truth I did a little more than chitchat on the net. I also was building some nice VHF gear and working 2m DX from New England mountaintops. I ran up a pretty good DX score too . . . won the ARRL Sweepstakes for my section . . . all while going to college, running a sandwich and laundry business, starting the campus broadcasting system (WRPI) and stuff like that, plus a romance which will be a feature chapter in my memoirs.

Even if you're retired you've still got a few years to start and run your own business. You'll be having so much fun you won't have time to die. And you'll be making so much money you won't even gripe about the *73* subscription price.

I'm going to build a national sales force to rep a bunch of music magazines and several hundred independent record companies, so if you have the time and a whole lot of interest let me know. I'm going to give hams first crack at what could turn out to be a pretty good business. If you think this is for you, I can send you the gory details.

Making Your Club Work

The only real organizations in our hobby are our local radio clubs, so it's important that we make them do as much as possible to help our hobby survive . . . perhaps even grow. And that means making meetings fun and recruiting potential new hams.

Let's mull over this fun thing first. Having been to more ham club meetings than you, by a wide margin, let me assure you that pitifully few of them qualify as candidates for fun evenings . . . except of course, ahem, if I'm on the program. And that's fun for me, even if it isn't for you.

If you're the president of a radio club it's highly unlikely you're going to be reading this. Most clubs seem to be firmly in the grips of old fogies . . . who really hate my editorials. They disagree with what little of them they can understand. And, having had their sense of humor atrophy from disuse, they try to take me seriously . . . which isn't going to get anyone anywhere.

Alas, they bring their old-fogy grumpiness to meetings to share with any ham newcomers who have the guts to chance trying the club. Many club meetings, having been taken over by these fogies, are exercises in group grumps. They bitch about the lousy bands. They gripe about no-coders. They kvetch about how expensive rigs are these days . . . somehow forgetting that their old nickel ice cream cones are now $1.62, with tax. Their diet tends more to bran and prune juice, so maybe they haven't bought a cone lately.

If the shoe doesn't fit with your club, be thankful. From my personal experience...and from hundreds of recent reader letters . . . I'm not exaggerating.

If you want to build up attendance at your club you have to make the meetings fun. This means making sure that your members keep an eye out for any newcomers and make a special effort to shake hands and rag-chew. Ever been rushed by a fraternity? They have a team waiting at the door which shakes your hand and guides you into the clubroom and gets you started talking.

The executive committee should take care of 90% of the club business so you can keep the business part of the meeting mercifully short. The common denominator is amateur radio, so get right on to talking about that. What's doing on 6m? How's 10m doing? Anyone work some good DX on 75 or 160? What's happening with packet? ATV? SSTV? How about high-speed CW?

Has anyone bought any new gear they can talk about? Anyone built something they've brought in to show? Is there a hamfest within driving distance where you can organize a convoy? How about a group flight to Dayton next year, complete with a group picture by the big hamfest sign?

Any contests coming up where the club can participate? Tried fox hunting on Sundays yet? How about a club video showing what interesting things your members are doing? Are your DX-ers all connected via a repeater so they won't miss any rare ones?

Have you any tech sessions before

Continued on page 87

KENWOOD

This device has not been approved by the Federal Communications Commission. This device is not, and may not be, offered for sale or lease, or sold or leased until approval of the FCC has been obtained.

Freedom of Choice

TM-741A Modular FM Transceiver

The choice is yours. Kenwood's new FM Multibander allows you to start as a deluxe dual band radio – or add a third band. As a dual band, you'll have access to 144 and 450 MHz operation.

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Your ultra-compact TM-741A offers a full 50 watts on 10, 6, and 2 meters; 35 watts on 450 MHz; 25 watts on 220 MHz, and 10 watts on 1200 MHz!

On 2 meters, you'll find wide band receiver coverage with RX on 118 - 174 MHz, and TX on the Amateur bands. The 2 meter section is modifiable for MARS and CAP (permits required).

303 memory channels are available, with 101 in any one band. Cross band repeat between bands, or, choose dual band input with cross repeat to the third band. The offset function is active on the output, allowing you to repeat to repeaters.

Other features

Individual volume and squelch controls for each band. Remote mounting of front panel with optional cable kit. Optional selective calling or group calling. Optional DTMF memory stores 15 characters for repeater controlling. Versatile scanning. Auto offset on 2m. Fixed detect output for packet radio.

Multi-function DTMF microphone. Separate antenna and speaker outputs. Auto power off and time-out. 4 step dimmer. 3 step power. Clock, timer and calendar. DC cable, and mobile bracket.

UT-28S: 28MHz, 50 W, RX: 24-36 MHz, TX: 28-29.7 MHz. **UT-50S**: 50MHz, 50 W, RX: 46-57 MHz, TX: 50-54 MHz. **UT-220S**: 220 MHz, 25 W, RX: 215-230 MHz, TX: 220-225 MHz. **UT-1200**: 1200 MHz, 10 W, 1240-1300 MHz. **DTU-2**: digital paging unit. **PG-4K**, **PG-4L**: remote cable kit. **MB-11**: extra mounting bracket. **PG-2N**: extra DC cable. **PG-3B**: DC line noise filter. **TSU-7**: CTCSS encode/decode unit.

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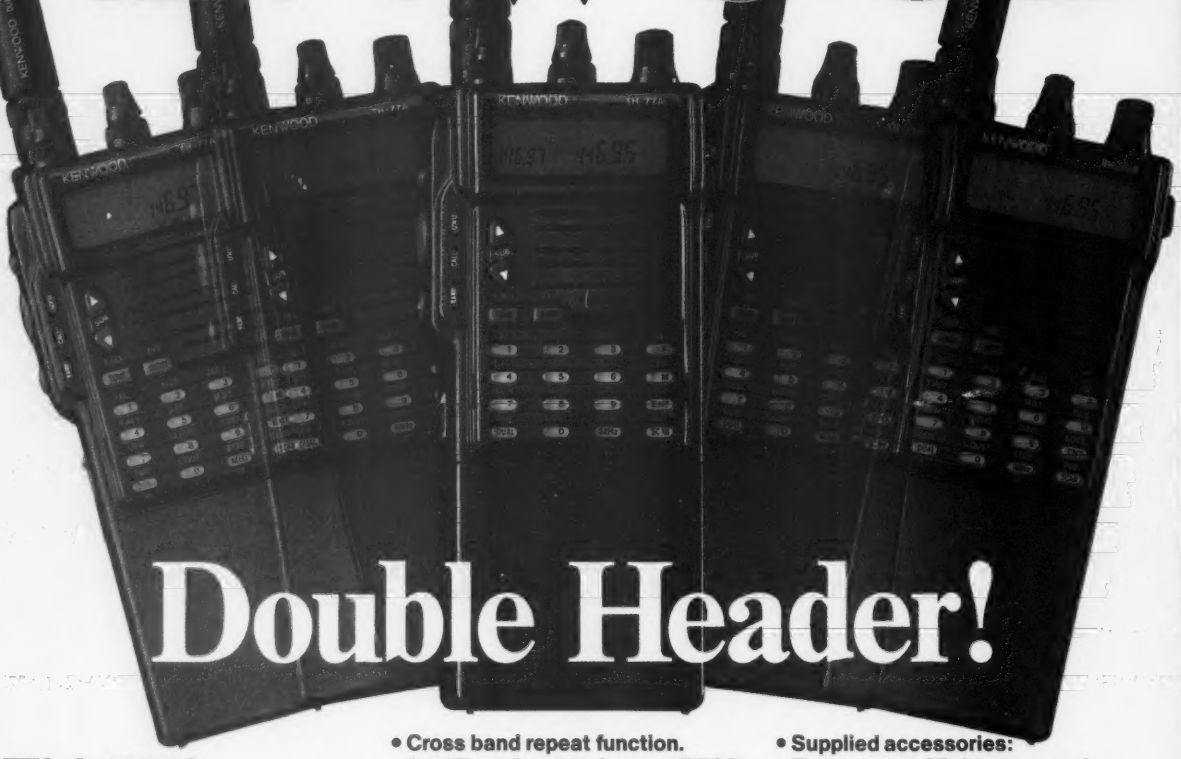

Double Header!

TH-77A

Compact 2m/70cm Dual Band HT

Here's a radio that deserves a double-take! The TH-77A is a feature-packed dual band radio compressed into an HT package. The accessories are compatible with our TH-75, TH-25, and TH-26 Series radios. Repeater and remote base users will appreciate the DTMF memory that can store *all* of the DTMF characters (*, #, A, B, C, and D) that are usually required for repeater functions!

- **Wide band receiver coverage.** 136–165 (118–165 [AM mode 118–136] MHz after modification) and 438–449.995 MHz. TX on Amateur bands only. (Two meter section is modifiable for MARS/CAP. Permits required.)
- **Dual receive/dual LCD display.** Separate volume and squelch controls for each band. Audio output can be mixed or separated by using an external speaker.
- **Cross band repeat function.**
- **Dual Tone Squelch System (DTSS).** Uses standard DTMF to open squelch.
- **CTCSS encode/decode built-in.**
- **Forty-two memory channels.** All channels odd split capable.
- **DTMF memory/autodialer.** Ten 15-digit codes can be stored.
- **Direct keyboard frequency entry.** The rotary dial can also be used to select memory, frequency, frequency step, CTCSS, and scan direction.
- **Multi-function, dual scanning.** Time or carrier operated channel or band scanning.
- **Frequency step selectable for quick QSY.** Choose from 5, 10, 12.5, 15, 20, or 25 kHz steps.
- **Two watts (1.5 W on UHF) with supplied battery pack.** Five watts output with PB-8 battery pack or 13.8 volts. Low power is 500 mW.
- **DC direct-in operation** from 6.3–16 VDC with the PG-2W.
- **T-Alert with elapsed time indicator.**
- **Automatic repeater offset on 2 m.**
- **Battery-saving features.** Auto battery saver, auto power off function, and economy power mode.
- **Supplied accessories:** Flex antenna, PB-6 battery pack (7.2 V, 600 mAH), wall charger, belt hook, wrist strap, keyboard cover.

Optional accessories:
• **BC-10:** Compact charger • **BC-11:** Rapid charger • **BH-6:** Swivel mount • **BT-6:** AAA battery case • **DC-1/PG-2V:** DC adapter • **DC-4:** Mobile charger for PB-10 • **DC-5:** Mobile charger for PB-6, 7, 9 • **PB-5:** 7.2 V, 200 mAh NiCd pack for 2.5 W output • **PB-6:** 7.2 V, 600 mAh NiCd pack • **PB-7:** 7.2 V, 1100 mAh NiCd pack • **PB-8:** 12 V, 600 mAh NiCd for 5 W output • **PB-9:** 7.2 V, 600 mAh NiCd with built-in charger • **PB-11:** 12 V, 600 mAh OR 6 V, 1200 mAh, for 5 W OR 2 W • **HMC-2:** Headset with VOX and PTT • **PG-2W:** DC cable w/fuse • **PG-3F:** DC cable with filter and cigarette lighter plug • **SC-28, 29:** Soft case • **SMC-30/31:** Speaker mics. • **SMC-33:** Speaker mic. w/remote control • **WR-1:** Water resistant bag.

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Specifications and features are subject to change without notice or obligation.

QRX . . .

EDITED BY LINDA RENEAU KA1UKM

ARRL Petition for 216–220 MHz

The ARRL has filed a petition with the FCC to request an Amateur Radio Service secondary allocation at 216–220 MHz. The massive, half-inch proposal weighs a full pound. Comprised of four sections and three exhibits, it is well-documented and impressive. The ARRL states that "This allocation would provide re-accommodation for those present and future wideband data intercity links and other point-to-point fixed amateur stations . . . displaced [last August] from the 220–222 MHz band as a result of the reallocation of that segment in Docket 87-14."

The League believes that amateurs can peacefully co-exist with present and future users of the band. The Commission may also have this belief, since it was they who initially suggested this approach. The 216–220 MHz band is currently allocated to various mobile and fixed services. The ARRL petition asks that Part 97.303(e) be changed to read: ". . . the segment 216–220 MHz shall be used only for point-to-point amateur fixed operation. No amateur station operating in that segment shall cause harmful interference to, nor is protected from interference from, maritime mobile stations, fixed stations, or other mobile licensees operating in the band. Nor shall harmful interference to broadcast television reception be created from operating in that band. Prior to commencement of amateur operation in that band, amateur stations are cautioned to contact a database administrator for the Amateur Radio Service for frequency recommendations in order to avoid interference to licensees of other services. The Licensee of the amateur station must make all necessary adjustments, including termination of all transmissions, if harmful interference is caused."

Part 97.313(d) would also be changed to read: "In the 216–220 MHz segment of the 1.25m band, no station may transmit with a transmitter power exceeding 50W PEP." TNX *W5YI Report, Vol. 13, Issue #13.*

PRB-1 Validity Questioned

A federal appeals court has ruled that ham radio operators are not entitled to absolute protection by FCC statutes enacted to give them special rights to have antennas. In doing so, the court has brought the constitutionality of PRB-1 into question. On June 19, 1991, the 9th Circuit Court of Appeals for Northern California denied a claim by a Burlingame, California resident, Vernon Howard W6ERS, who argued that federal law guaranteed his right to build a 51-foot antenna tower in his back yard, and his right to use it freely to communicate with fellow hams worldwide. The three-judge appeals panel rejected Howard's contention that the city violated his free speech rights.

According to Howard, his initial application for a variance was turned down in 1987 after what he feels was an unfair hearing by the Burlingame planning board. W6ERS said that forced him to take the city to federal district court. The judge ruled in his favor, based on PRB-1 guarantees, so Howard installed his tower and antenna, then went about trying to recover the $25,000 he had spent in court costs and legal fees. When this failed, W6ERS took legal action on his demand for reimbursement. It appears that this action resulted in the city deciding to let the appeals court make a final determination based solely on the merits of the issues.

The court ruled that FCC regulations entitle ham radio operators only to a "fair consideration by city officials" of their applications to build antennas. Cities and municipalities are still required to make a "reasonable effort consistent with local zoning goals to accommodate the projects," as mandated by PRB-1, but at the same time stating that esthetics can be considered in making a determination of whether to allow the erection of such structures.

The decision upholds the earlier ruling of a federal district judge in San Francisco who validated Burlingame's authority to regulate the heights of back yard antennas over 25 feet high, and cites the 4th Circuit U.S. Court of Appeals decision in Williams vs City of Columbia, South Carolina, where the court said the city had complied with PRB-1 by allowing a 17-foot high antenna. These decisions questioning the constitutionality of PRB-1 are at odds with other federal appeals courts which have agreed with the FCC and the amateur radio community on PRB-1's constitutionality.

Eventually, PRB-1's validity will probably have to be determined by the United States Supreme Court. According to one attorney, the Howard vs Burlingame findings are damaging for ham radio. The case will appear as a precedent-setting decision of the court that is just one level below the Supreme Court. It will also be published in the *Federal Register,* which is kept in virtually every law library in the country. Every city attorney who reads it will learn that a city has the legal right to flatly turn down any antenna permit request despite PRB-1. TNX *Westlink Report, Number 605.*

Haas Convicted

Last June, James A. Haas, 39, of Athens, Ohio, pleaded guilty in a U.S. District Court trial in Alexandria, Virginia, to federal charges of broadcasting a false officer-in-distress call and using a credit card without authorization to buy $1,000 in radio equipment. Haas, adviser to the ham radio club at the high school where he has taught physical education for 17 years, could face up to 15 years in prison. Currently out on $100,000 bail, he will be sentenced on August 30, 1991.

In April 1991, FBI agents caught Haas in his van, transmitting a false officer-in-distress call on a Prince William County police radio channel. He was parked in a Sterling, Virginia, neighborhood where he was staying with friends so that he could attend a hamfest in Baltimore. In his plea agreement, stating that he would cooperate with federal authorities, he admitted making a similar call to the Prince William County department in July 1990.

The FBI had been on Haas' trail since February in connection with similar broadcasts in Kentucky and Ohio. They suspected him of making dozens of fake distress calls, many of which resulted in massive searches by police agencies. One search that involved 15 agencies and the use of helicopters lasted 10 hours. According to police authorities, Haas could also face charges for fake calls made in Kentucky and Ohio as well as in Virginia. TNX *to Steve Boch at Universal Radio, in Reynoldsburg, Ohio, for the newspaper clipping, and Bob Blinn for the story on MCImail.*

Amateur Radio Spectrum

The Amateur Radio Service has only 2/10 of 1% of the total amount of spectrum from 0–30 GHz allocated for its exclusive use. Amateur radio is sometimes described as having generous spectrum allocations. For example, on the 220–222 MHz re-allocation, the FCC stated repeatedly that amateurs have substantial amounts of other spectrum in which to operate. A chart used by the ARRL, however, clearly shows that of the less than 5% of spectrum allocated to it, the Amateur Radio Service shares 4.5% with other services, and is subject to their interference. TNX *W5YI Report, Vol. 13, Issue #14.*

WWV Solar Report

The WWV Solar report is now updated at 2118 UTC, rather than at 1818 UTC. This is because the solar flux is currently measured at a British Columbia solar station, rather than from Ottawa. The K index will continue to be updated every three hours, as at present.

Speaking of solar activity: Those strange whistles on the low bands last June were examples of "Type II" radio sweeps generated by solar flares from sunspots in a region designated as 6659, an area at least 50 times the size of the earth. This gave DXers a major opportunity to experience the effects of major flares on radio propagation.

The onset of the flare is marked by a SID

QRX . . .

(Sudden Ionospheric Disturbance), followed seconds later by the disappearance of HF signals from the sunlit side of the earth. About 15–20 minutes after that, a slow, decreasing whistle moves through the bands. Soon after the flare dies, the bands recover, but only to deteriorate 30–48 hours later, when the slower-moving charged particles from the sun disrupt the geomagnetic field.

Large solar flares can also produce magnetic waves that compress the earth's geomagnetic field and send power surges down electrical transmission lines and pipelines. TNX "The DX Bulletin," Issue 593, and *Westlink Report, Number 604.*

RSGB Awards Astronaut

The Radio Society of Great Britain presented UK Astronaut Helen Sharman (GB1MIR/UA) with a commemorative copy of its new video titled "Amateur Radio—The Hobby of the Space Age," in recognition of her becoming the first citizen of the United Kingdom to operate an amateur radio station from earth orbit. Last May, Sharman spent several days on the Soviet *Mir* space station and operated its amateur radio installation, talking to students in schools throughout Great Britain. Musa Manarov U2MIR was her host. TNX *Westlink Report, Number 605.*

Balloon Launch

The Dayton Amateur Radio Association (DARA) sponsored helium high altitude amateur radio experiment was successfully launched last June 29 at 9:20 a.m. The balloon attained a maximum altitude of 86,000 feet (over 16 miles) and was recovered three minutes after it landed in Beavercreek by the RDF crew headed by Paul Bohrer W9DUU.

During the 2 1/2 hour flight, the 20 meter beacon was heard throughout the world. Dara is still receiving QSL cards. The 2 meter beacon was heard, and the ATV beacon seen, out to about 450 miles from Dayton. Returns have been received from New York, Pennsylvania, Connecticut, South Carolina, Iowa, Michigan, and Kentucky, as well as Ohio.

The event was organized by Dave AH2AR, with help from many hams, including N8NEU, KB8EMD, W8LLW, N8JAF, W8ILC, W8RVH, K8GCS, and WB8ELK.

Bill Brown WB8ELK, editor of *73 Magazine*, added a 35mm camera to the balloon payload and some great photos were taken up to 60,000 feet before the camera froze.

Brown is scheduled to be the guest speaker at the first DARA meeting in October. His ATV presentation will cover high altitude unmanned balloon launches and amateur radio experiments. TNX Dave AH2AR via "RF-Carrier," Vol. 35, No. 11. *[See this month's "ATV" column for the complete story.]*

NiMH Batteries

A new battery technology may soon replace NiCds. Nickel-metal-hydride, or NiMH batteries, have 80–100% more electrical storage capacity by weight. These batteries have recently passed a testing milestone of 20,000 charge/discharge cycles at 30% depth of discharge. This could be a significant advantage for small satellites. A quantity of the new batteries is being obtained from Ovonic Battery Company of Troy, Michigan, by builders of the SEDSAT-1 amateur satellite.

The satellite will use a current-regulated power system with the voltage tentatively set at 30 volts. There will be 40 cells aranged as two batteries, giving 30 volts DC at a full charge of 100 amp/hours per battery. A prototype of the power system will be constructed at the Marshall Space Flight Center, Electronics Branch, by NASA personnel and by University of Alabama Students for the Exploration and Development of Space (SEDS), an AMSAT-NA Member Society.

In conjunction with the NiMH batteries, the 14″ x 14″ x 12″ SEDSAT-1 will use high efficiency (about 26%) AlGaAs/CIS tandem solar cells donated by Boeing Defense and Space Company, Renton, Washington.

Volunteers of the new AMSAT-NA Spacecraft Lab in Detroit, in consultation with other AMSAT-NA engineers and technicians, plan to construct the OSCAR communications package for the project. TNX "Oscar Satellite Report," Number 224.

UoSAT-F Launched in July

UoSAT-F, also known as OSCAR-22, provides store-and-forward communications for SatelLife, an international nonprofit network for health professionals. Initially, five African medical schools will use HealthNet to receive e-mail and up-to-date medical literature. When not serving HealthNet on commercial frequencies, UO-22 will QSY to amateur satellite channels, sending AX.25 data at 9600 bps.

The amateur uplink is on 2 meters, the downlink on 70cm. Stations using UO-14 will be able to receive UO-22 with the same software and hardware. Telemetry, status messages, and files are transmitted in the same pattern and format.

UO-22's role will be similar to that of UO-9, -11, and WEBERSAT. Instead of providing two-way communications, it will transmit experimental data and telemetry. It carries a CCD camera with a wide-angle lens, and will broadcast images using the PACSAT Protocol. TNX John Magliacane, MCImail "SpaceNews" for informing us of the launch, and *Westlink Report, No. 604.* Also, for more details on SatelLife, which is overseen by a distinguished board of scientists and physicians, see "QRX" in the June 1990 issue of *73*, or call Sharyn Cooper at (617) 661–6468.

11 Meter Soporific

A 27 MHz instrument appears to stimulate sleep-inducing areas of the brain, says Boris Pasche of Brigham and Women's Hospital in Boston. Co-author of a study led by Milton K. Erman of the Scripps Clinic and Research Foundation in La Jolla, California, Pasche and his colleagues are now investigating its effect on melatonin, a hormone secreted by the pineal glad in sync with the sleep-wake cycle.

Insomniacs using the device fell asleep 52 minutes faster than control subjects using inactive devices, and slept 1.5 hours longer. Although the Environmental Protection Agency reported last year that steady, weak electromagnetic fields constitute "a possible but not proven cause of cancer," Pasche says he and his colleagues do not believe this device has any adverse effects because it does not emit a steady magnetic field. TNX Miles Abernathy N5KOB for this excerpt from *Science News*, July 6, 1991.

73 BBS

The 73 BBS crashed recently (it literally fell off of the table), but it is now up and running. Since we weren't overly thrilled with the old BBS software, we politely swept the pieces under the table and installed a new BBS package called OPUS. There are separate sections for messages or files under each SIG (Special Interest Group). This should make it easier to find programs and files without having to wade through dozens of messages (as in the old software). Most of the programs and files listed in past issues of *73* are available in the "File" section of the *73 Magazine* area (it may take awhile to recover them all). Use the "Messages" section to send bulletins or leave messages. Please let us know how you like the new BBS; just leave our SYSOP Joyce a message when you log off. The BBS phone number is (603) 525–4438.

N4RVE Discovered

High tech nomad Steve Roberts N4RVE and his new computer/ham radio/gadget-laden bicycle, the Behemoth, appeared in the July issue of *Discover* magazine. In 1988–89, Steve wrote a series of articles on hamming and computing across America on his solar-powered Winnebiko. Last year, he built the Behemoth, which stands for Big Electronic Human Energized Machine. TNX *Discover* and *W5YI.*

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Packet...plus!

If you want the best Packet or multi-mode equipment available, look no further. These data controllers have no equal when it comes to features, performance and value.

The versatile DSP-2232 (above) is simply the most powerful multi-mode controller available to amateurs. It features Digital Signal Processing modems, dual simultaneous ports, all known amateur digital modes, Packet and AMTOR mailboxes, and much more.

The legendary PK-232MBX (top right) has long been the most popular data controller ever, and is still going strong. Includes: Chebyshev filter design, Host Mode, Signal Identification mode and more. With features like these, no wonder it's number 1.

For Packet only, the PK-88 (center) and its PC-compatible plug-in counterpart, the PCB-88 (bottom right) offer AEA's famous Host Mode, Packet maildrop, KISS mode, lithium battery-backed RAM...the list goes on and on.

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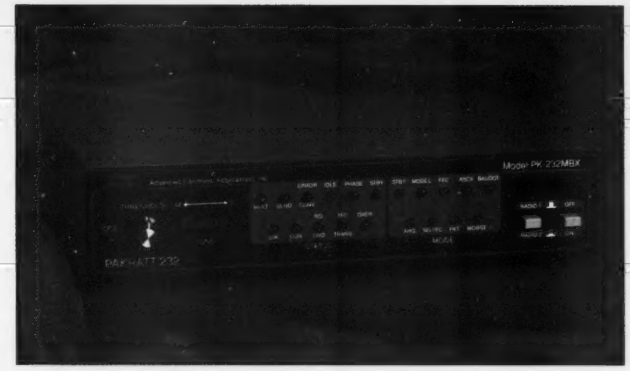

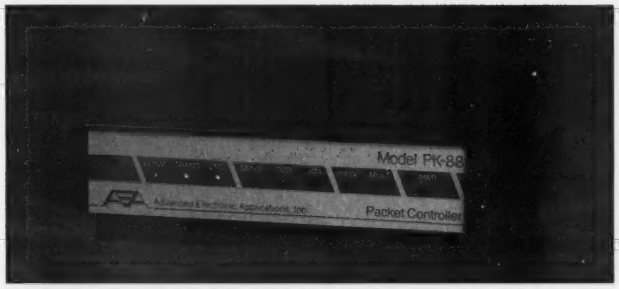

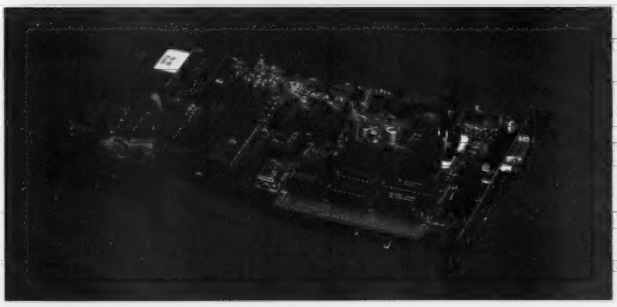

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LETTERS

From the Hamshack

David KB5LAM/4 The May '91 issue was the best yet. I'm pulling together everything I need to build 'em all. I'm on VHF packet via KK4CQ, but not too many want to QSO. Lots of "busy" messages. There are a *bunch* of hams around Pensacola. There's Sam N4SAR, who has a school program going . . . he's had his 100th licensee in the many years he's been at this.

I've finally had a chance to read the last five years of *73, QST,* and *CQ.* I looked for good construction articles which were interesting, but not too daunting. I marked 'em with "Post-Its." *QST* had good stuff once a quarter or so, and they asked for money a lot. *CQ* did okay with antennas, in between endless contest scores and announcements. *73* was the clear winner by a couple pads of notes. You've also gotten better. The last two years have given more encouragement and better gadgets I believe I can do.

You're a good man, Wayne Green. I've learned much from you and those you've gotten to write for you; and not just about radio. Say, if you learn of someone needing a *good* manufacturing/quality engineer, let me know. I love to build things *right*!

Tell Sam I'll believe he's making Novices when he starts sending pictures for us to publish. . . . Wayne

Rob ND1V Hello from a fellow submariner. Enjoyed your *USS Drum* (SSN) trip, wished I could have met you. I'm an ETC/SS and an Electronic Surveillance Measures (ESM) tech. I used to be on the *USS Silversides* (SSN-679). The ET school would greatly disappoint you these days. They now teach these guys to troubleshoot to the "board" level and not much deeper. A generation of black-box techs. Oh, well, it saves the taxpayers money, so they say.

That's bad news! I wonder if they can carry enough spare boards to fix anything that goes wrong? The next step is to have the boards self-checking so we can save taxpayers the whole ET school cost. With two of each board in every unit, a future ET would only have to replace the bum boards as they burn out. The equipment would keep right on running. . . . Wayne

Thomas Wyckoff, Kenilworth NJ I picked up a copy of *73 Today*, and the only thing I didn't like about it was that the back page was too close to the front page.

I passed the tests for the no-code Tech last week, and have been listening to the bitching on 2 meters while I wait for my license to arrive. I wonder how these old geezers would react if they were told that they had to pass a test on IBM 360 assembler before they would be allowed to connect a PC to their rigs and get into packet radio.

One of the things the FCC was created for is to balance the allocation of the frequency spectrum with the needs of the users. Since we are only one-quarter of one percent of the population, I can see us losing a lot of frequencies in the future unless we greatly multiply in numbers, and do it quickly. Us no-code Techs may well be the salvation of amateur radio, not its downfall. Sooner or later some politician will stumble on the fact that 99.95% of the population is limited to CB or cellular phones, and make an issue out of it. When that happens, God help amateur radio. Cellular phones are nice, but every time I look at mine, I am reminded of a TV game show from about 30 years ago, a show called "Dollar a Second."

Doug Pine NH6ZA, Makawao HI I was re-licensed last month after almost 15 years of inactivity. At age 13 I was an active General class ham (WA6CKK) and proud of it. I even had a subscription to your magazine and was a member of the ARRL. Before too long, though, high school, surfing, and girls turned my head. I wanted to remain an active ham, but no one I knew among my ham friends wanted to talk about anything but electronics, repeaters, and transistors. I always thought there was more to the hobby than that, and for a while I knew a few people on 40 meters who agreed with me. We talked about surfing, music, politics, religion, drugs, women, and anything else we felt like. We weren't using foul language or improper procedures. We were within the bands, and we identified legally, and anyone was welcome. We were exercising our minds and our hobby at the same time. It was FUN! We called ourselves the "Free Thinkers' Net," and had a grand old time of it. After a few months, we began getting harassed and even jammed by "proper" hams who felt it was their duty to "keep us in line," as one OM put it. I called it quits at 17, sold my station, bought a surfboard, and moved to Hawaii.

Now I'm 30, married with a kid on the way, settling down, all that scary stuff. The radio bug bit again about a year ago. This spring I got out the study guide and passed my General class exam. I haven't gotten on the air yet for lack of a rig, but I will soon. I picked up the June issue of *73* and read it. Lots of new things; let's see . . . this packet stuff looks interesting, satellites are happening, the latest rigs are amazing. I read your editorial. Nice satire about the QSO machine, but the point it made caught my attention the most. The same stuff I tried to do 15 years ago—get beyond the standard QSO: name, QTH, rig, pse QSL, 73 and good-bye. Communicating. Learning about human beings on the other side of the world firsthand. I'm hoping to be able to do just that when I get back on the air. I'm not at all surprised to read that most hams still don't communicate beyond the most basic level.

I wasn't surprised to read about all the furor over the no-code Tech. Old traditions die hard, don't they? Knowing how to send 30 wpm doesn't make me a good operator; my desire to be one leads me in that direction. I don't know jack-diddly about theory. Does that make me an unwanted member of this fraternity? I just love the magic of radio, period.

I took my test with a room full of people going for the no-code. They were sincere and excited about their entry into this hobby, and almost without exception planned to continue onwards and upwards. More power to 'em, I say.

Doug, Max Planck (the physicist who formulated the quantum theory) said it this way: "A new scientific truth does not triumph by convincing its opponents and making them see the light, but rather because its opponents eventually die and a new generation grows up that is familiar with it." Or, as my grandmother used to say, "A man convinced against his will is of the same opinion still." So Doug, let's keep watching the Silent Keys list as the CW fanatics are gradually all listed and replaced by newcomers. . . . Wayne

Rudy Ault N2JZK, Troy NY My latest issue of *73* arrived today. As usual, I was reading "Never Say Die" before the plastic wrapper hit the floor. The things I found irked me into writing this letter at the odd hour of two a.m.

I live in the Albany-Troy-Schenectady area of New York. There are some things going on over here that you may find out of the ordinary for amateur radio these days. In your last issue you mentioned passing through Troy and not being able to find anyone on a repeater. You must not have tried the 147.27/.87 machine on the Ch. 13 tower at Bald Mt. There is a group of people there who don't fit into the amateur mold. We joke around, we discuss everything from the Civil War to astronomy, we are HAMS. You would fit in here, Wayne. Why not try to call us one night? This machine has a tremendous range.

Bill Eddy NY2U is the president of the Troy Amateur Radio Association. He was important in founding the Capitol District Amateur Radio Council, CDARC, which co-ordinates the efforts of the member clubs in this area. They even sponsor a twice-weekly bulletin broadcast on all member repeaters. Steve WA3RKB keeps us informed of events, news, and VE exams, all via 2 meter repeaters.

The Rennsselaer County RACES club is making great strides in interlinking its three repeaters to give full 2m coverage to the county. Lance WS2B is doing the hookups (with a small break to graduate from high school). Lance, an Eagle Scout and the repeater manager for the county RACES, is 17-years-old.

Since I got my first call in 1988 (KB2FVR), there has been an average of one VE session per month in this area. I upgraded to Technician and drug my poor wife into the hobby as she kicked and screamed. Her call is KB2LGA. She is also a Technician. My brother-in-law is now waiting for his new Technician ticket. He cannot do code, Wayne, but he has written several computer programs that will. My brother Ricky passed his Novice written, and is planning on getting his Technician soon. He will be quite an asset to the Frederick County, Maryland, area.

Some of us *are* trying, Wayne. Some of us do dream, and hope, and work to better the hobby. When you get in town again, give a call to some of our clubs . . . we are in the Yellow Pages!!!

William A. Ward N4BLR, Atlanta GA I am a black ham operator and proud of it. For years I have read your "Never Say Die" editorials devoutly, and have always enjoyed them. After reading what K9RGV had to say about the contributions of black hams, I agree with him, but I am personally fed up to here with the notion of having to have a "set aside program" for black hams. What will be next? A set-aside page for gays, Native Americans, etc.?

If you want people to know about you, the answer is PR and plenty of it. The percentage of blacks in ham radio is less than 1%. Here in Atlanta we have between 75 to 100 black hams. We have what is called the "corner" where quite a few black hams hang around. Some never leave these frequencies because they might have to talk to someone other than a black. It has always seemed to me that there's an underlying fear out there to talk to anyone unless they're black.

Having been born in the South, I know that some people's attitudes haven't changed much, even on the ham bands. I don't expect these bigots to change. From the time I received my ticket, I've operated all of the bands that I was licensed for. I've never been afraid to talk to anyone who would talk to me. I've met and had quite a few friends on 75 meters, especially around the Georgia SSB net frequency of 3.975, and I couldn't have met a nicer bunch of fellows.

Wayne, I've talked with some of the older black hams, and they have told of the hell they caught in the '50s, '60s, and '70s, and I can understand their frustrations and attitudes. However, we are living in the '90s, so let's act like we're living in the '90s. I am not going to shut myself off from the rest of the ham community.

What have I done in ham radio? I was instrumental in forming the Metro Atlanta Amateur Radio Society. I started a 40 Meters Traders Net three years ago, which has grown steadily. Incidentally, a few people said I couldn't get it to work because I'm black; what do they know? I reactivated an old net, the Fourth District Amateur Radio Society, that had quit operating. This net is geared towards sharing your technical expertise with others. I've appeared on a talk show to explain what ham radio is, and how one can get into it. I've built quite a few projects out of *73* over the past years, and I've enjoyed reading *73*. Most of my knowledge of electronics is self-taught by reading and experimenting.

Finally, I want to agree with you on boring QSOs. I'm really tired of conversations that are Boring, Boring, Boring. There must be a million things a person can talk about, but most never do. Does anyone ever watch any National Geographic Specials or C-Span or read any books? Are there any builders out there working on a new design? Every now and then I run across someone doing just that, and it's a pleasure to talk to him.

C.R. Phillips N3HTZ, Langhorne PA The president of a local repeater came on and chastised two new hams and myself for having a "CB rag-chew" on his club's repeater. What I want to know is what constitutes a CB rag-chew? I will not, and many of my friends agree, put my personality aside to talk on ham radio. I do not curse or talk about taboo things on ham radio, but I try to make interesting conversation. What an example the president of this local repeater club is setting towards new hams, and hams who may be traveling in the area. Keep up the good work, Wayne.

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73 Review

by David Cassidy N1GPH

The Outbacker All-Band HF Mobile Antenna

Results of a 12-month road test.

Outbacker Antenna Sales
330 Cedar Glen Circle
Chattanooga TN 37412
Price Class: 6 ft., $259; 4 ft., $219;
6 ft., 2-piece, $289.
Tel. (615) 899-3390.

Photo A. The Outbacker.

A little over a year ago, a new mobile antenna became available to the ham radio market. Called the Outbacker in honor of its Australian origins, this rugged yet attractive antenna soon began to show up on the bands and to receive some nice reviews in amateur radio publications.

For the last 12 months, I have been testing the standard one-piece, 6-foot, 8-band Outbacker. It has gone through a New England winter, has been installed on three different automobiles, and has been used as a base antenna at two different locations.

A Little History

The Outbacker antenna, as its name suggests, is a product of the Australian Outback. Terlin Aerials of Australia has produced this antenna for 15 years, serving customers who need a no-nonsense mobile antenna that can survive the extreme conditions of the harsh Australian Outback. The Outback is a vast area of the Australian continent where ranches are measured in hundreds of miles. There is no telephone service to most of this area, so those who live and work there rely on HF and VHF radio for just about all of their communications. When the nearest medical facility is hours away by air, even a compound fracture can turn into a life-threatening emergency. To people of the Outback, the performance of their radio gear is literally a life-and-death matter.

The man who brought the Outbacker to the U.S. market is Don Arnold WD4FSY. Don is a professional photographer who travels the world. When his profession brought him to the Outback of northern Australia, he noticed that every Jeep, Land Rover and truck had the same thing—an epoxy resin coated multiband antenna. Being a ham, he checked into this unusual looking aerial. What he discovered is that Terlin Aerials manufactures these HF antennas in a variety of multi-band configurations—for business, marine. Don received a ham band version of the Outbacker, and was so impressed that he arranged to have a few more sent as prototypes. Thus was born Outbacker Antenna Sales of Chattanooga, Tennessee.

The first time I met Don face-to-face was at the Southwestern Convention in San Diego. Since then I've seen him at every major hamfest, usually with the same set-up. He gets a booth by the door, runs some coax to the outside, and sets up one of his Outbackers (usually hidden in a potted plant or some other form of shrubbery). Don is also fond of demonstrating the strength and durability of his product by bending the antenna almost fully back on itself, inviting passers-by to slam the antenna against the floor, or by pounding the living daylights out of the antenna with a hammer. I've seen this demonstration dozens of times now, and I've yet to see an Outbacker damaged by this rough treatment.

The Antenna

The Outbacker is a hollow fiberglass pole covered with a black epoxy resin and a final protective coating (if you're willing to wait several weeks, you can order an Outbacker direct from Outbacker Antenna Sales in almost any color you want). There's a 6-foot version, a 4-foot version, and a 2-piece 6-footer.

The main antenna is a helical copper coil. Each antenna is handmade by Terlin Aeriels of Australia. After the antenna is manufactured, each is hand-tuned for accuracy and field tested for each band of operation.

The unique way the Outbacker provides all-band performance is something they call the "wander lead." The wander lead is coiled around the outside of the antenna, and one end is inserted via a banana plug into a jack near the base of the antenna. The antenna has a series of silver-coated brass jacks recessed into the fiberglass, each jack corresponding to a different band of operation. To change bands, you simply wind the wander lead around the antenna and insert the plug into the appropriate jack.

There is also a short whip at the top, which allows for fine tuning the SWR. The whip has a mark scored on the side. Setting the whip at this level gives you a good SWR from 40–10 meters. If you want to operate 75 meters or the high end of 10 meters, it's a good idea to put an SWR meter in line and reset the whip.

You can purchase a heavy duty spring mount from your Outbacker dealer. This is one of the sturdiest mobile mounts I have ever seen, and if you have the type of vehicle that can accommodate this, it would probably survive long after the vehicle crumbled to dust. For those of us who don't want to permanently alter our rubber-bumpered cars, Outbacker suggests the 4-foot Outbacker Jr. model with a Diamond K400-3/8, 24 lip mount. This grips your trunk or hatchback with only a couple of puckers on the internal side (which helps ground the mount to the car body) and holds up fine to highway speeds. Mounting the antenna at trunk or hatchback level also gets the majority of the radiating surface above the car body. This arrangement is only for the 4-foot Outbacker, and you need to put a heavy duty spring between the mount and the antenna.

The One-Year Road Test

There is a right way to install a mobile antenna and a wrong way. Not wanting to wait to test out the Outbacker, I immediately ran down to my local Radio Shack and purchased one of those bumper mounts with the little clip and chain arrangements. These used to work just dandy on older cars with metal bumpers, but I quickly found out that my old rust-bucket was equipped with those darn rubber bumpers. Undaunted, I found a place to clip the hold-down chains, braced the whole thing with a bungee cord so the 6-foot Outbacker wouldn't sway in the breeze, ran the coax to the front of the car, hooked up my HF rig and away I drove. (In case any of you are wondering, this is the wrong way to install a mobile antenna.)

My first contact was on 20 meters with a ham in Manchester, England. He was very cooperative in answering questions about my signal and reported a strong 5 x 7. Not bad for 100 watts, a stock hand mike and an antenna that, despite the bungee cord arrangement, was tilting in the breeze at about a 30 degree angle! After clearing with the chap in Great Britain, a ham in Florida called to report that he was receiving me at about the same 5 x 7.

For the next few weeks I checked into WB2JKJ's Classroom Net on 40 meters (7.238 MHz at 7 a.m. This is a great rag-chew net for

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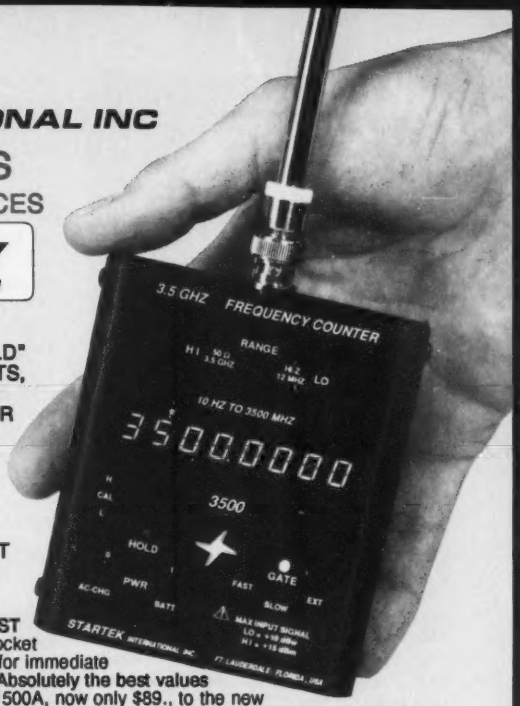

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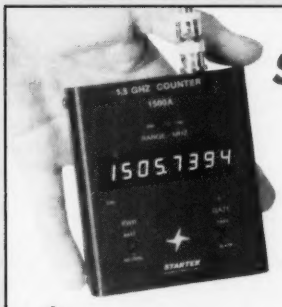

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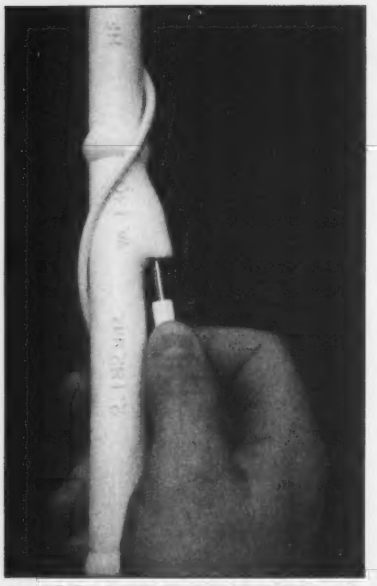

Photo B. To change bands just wrap the "wander lead" around the antenna and insert the jack into the appropriate plug.

morning commuters. It is operated by Joe Fairclough—one of the nicest guys you'll ever meet in ham radio—out of The Radio Club of Junior High School 22 in New York City.). The net was very helpful in establishing the omnidirectional performance of the antenna. Consistent reports from upstate New York, Virginia and Canada proved the Outbacker was putting out a nice signal to all points on the compass.

Since I knew my car was destined for the junk pile, I didn't bother with a more permanent mounting arrangement. For using the 6-foot Outbacker, I would suggest either side-mounting the antenna (which requires drilling into the car body) or some kind of trailer hitch arrangement. Both of these options can be done using the heavy-duty spring mount mentioned earlier.

The Outbacker as a Base Antenna

Not too long ago I was living in a one-bedroom apartment. I tried all kinds of schemes to get an HF signal out with indoor or invisible outdoor antennas. Though I now have plenty of space for outside wires, I was anxious to test the Outbacker as an apartment/condo antenna.

A quick trip to the hardware store or Radio Shack should provide you with all the ideas and materials for fabricating a window mount for the antenna (I used the bumper mount mentioned earlier, and a few clamps and L-brackets from the hardware store). Open the window, mount the antenna, run the coax, and you're on the air. From my ground floor location, I was not setting the bands on fire, but I made plenty of contacts—especially on 10 and 40 meters. Changing bands was a matter of opening the window and reaching out to change the wander lead. I figured this was a small price to pay for 80–10 meter capabilities. When I was done operating for the evening, I simply brought the antenna in.

The secret of operating with this type of arrangement is the ground connection. The antenna mount should be wired to the best possible ground available. Some of my QSOs reported a 3–5 dB loss of signal when I disconnected my cold water pipe ground lead. If a ground is not available (or in addition to a ground), a 1/4-wave counterpoise wire can be attached for each band of operation (using ribbon cable for this will keep things neat). Either throw the counterpoise wires out the window or run them along the wall of your shack.

An alternative for those who have first floor apartments is to park your car near your shack, leave the antenna mounted on your vehicle, and run the coax into your shack window.

Don't expect to break into any 20 meter pile-ups with this arrangement, but you'll still have plenty of signal for normal rag-chewing. I think the Outbacker is a great choice for the apartment/condo ham.

Further Road Work

When I traded in the old clunker for a new compact car, I was leery of mounting any antennas on

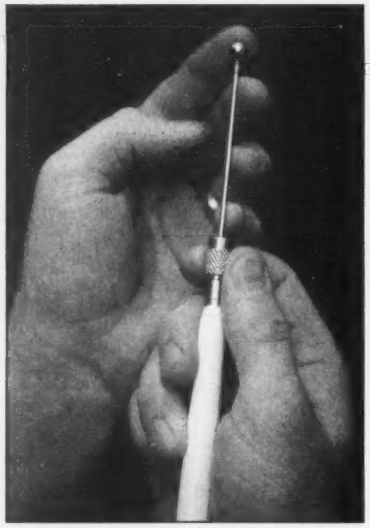

Photo C. The adjustable tip allows for fine-tuning SWR.

that nice shiny paint. When the new car went back to the dealership for service, I was provided a loaner vehicle. The desire to check in with some friends on 80 meters during a late-night/early-morning solo drive across New England provided the perfect opportunity to test the Outbacker in another configuration.

I mounted a 4-foot Outbacker Jr. to the car with a Diamond trunk mount (make sure you use a heavy duty spring and NEVER attempt this with the 6-foot Outbacker), ran the coax to the front seat, and I was on the air. Total install time: five minutes.

The performance of the 4-foot Outbacker Jr. is surprisingly close to the performance of the full-size version. I didn't have any trouble making local contacts on 40 meters, and I was able to key up the Virgin Islands 10 meter repeater with only 20 watts. That evening, I QSOed with my friends on 80 meters for over two hours. I usually received them at the same level I do from my home shack—10 dB over S-9. When I first joined the roundtable, they were shocked to discover that I was operating mobile. Solid S-9+ signals were reported throughout my journey.

For those who travel and use rental cars a lot, an Outbacker Jr., a Diamond trunk mount and a small HF rig would be a perfect travel setup. The 6-foot Outbacker is offered in a two-piece model, but the trunk mount won't handle this antenna. If Outbacker would come out with a four foot, two-piece version, the entire set-up could fit in a carry-on bag.

Final Thoughts

To put it bluntly, I am very impressed with the Outbacker. It is easily the most attractive multi-band HF antenna available. The black epoxy can be buffed to like-new condition with auto wax, so even after a New England winter (where salt and sand coat the roads for four months), the antenna looks like it just came out of the box. If you're willing to wait, you can even order an antenna that matches your car. (Outbacker offers other special models, including HF marine. In fact, you can special order just about any combination of special frequencies.)

The Outbacker is hand-made, and the quality is evident. Plugs and jacks are silver coated brass. The wander lead is heavy enough to stand up to weather, but light enough to easily wrap around the antenna. I can't imagine how anyone could damage this antenna, even under extreme conditions. The final coating applied over the epoxy resin will sometimes peel a little around the recessed jacks, but this is barely noticeable, and in no way affects the strength or performance of the antenna.

I found the on-the-air performance of the Outbacker equal to any other mobile antenna I have used, and the wander-lead system of band switching very convenient—much easier than carrying around a trunk full of loading coils.

When you take great mobile multi-band performance and add the easy portable and apartment/condo applications, I think the Outbacker is a great choice for a variety of HF antenna uses. 73

Photo D. The Diamond K-400 mount. Outbacker recommends this sturdy trunk/hatchback mount for the 4-foot Outbacker Jr.

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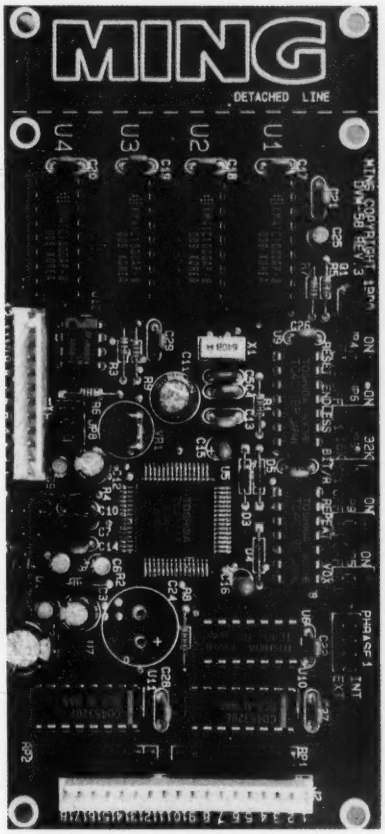

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The *RELM* RSP500B-A is our most popular programmable 5 watt, 20 channel handheld transceiver. You can scan 20 channels at up to 40 channels per second. It includes CTCSS tone and digital coded squelch. Snap on batteries give you plenty of power. Additional features such as time-out timer, busy-channel lockout, cloning, plug-in programming and IBM PC compatability are standard. It is F.C.C. type accepted for data transmission and D.O.C. approved. We recommend also ordering the **BC45** rapid charge 1½ hour desk battery charger for $99.95, a deluxe leather case **LC45** for $48.95 and an external speaker microphone with clip **SM45** for $59.95. Since this radio is programmed with an external programmer, be sure to also order one **PM45** at $74.95 for your radio system.

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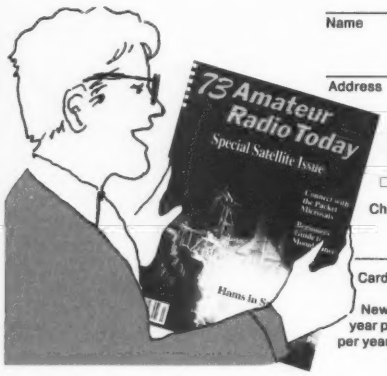

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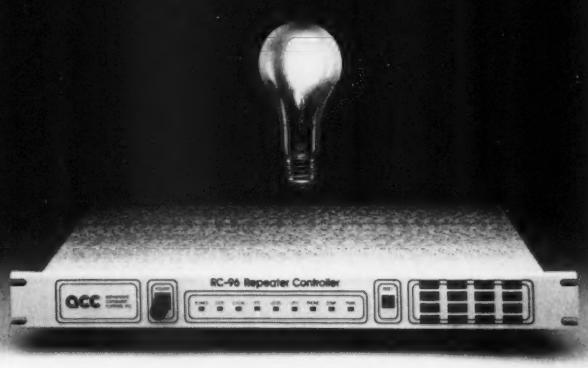

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The Square Pancake Antenna

The indoor marvel.

by Ken M. Doolittle W2SMR

Apartment dwellers, ATTENTION!! Here is a limited-space, simple, and inexpensive inside antenna that works. I've made hundreds of complete QSOs with this little 20-inch square that hangs from the ceiling over my rig. I can reach up and tune it in a few seconds. Frequency coverage is 80, 40, 30, and 20 meters.

For comparison, I often switch to my 40 meter center-fed Zepp. With 1–50 watts into the antenna, signal strength reports vary from 0–5 S-units below the Zepp. Not bad for an inside antenna only 10 feet above the ground.

There's nothing magical about this antenna. The basic design has existed in various forms for many years, but it has seen little use for transmitting because of high losses. However, in spite of losses, you will be amazed at the results you can get. Twenty meters, for example, has yielded many DX stations. On 3537 kHz, I worked YU7WW in Belgrade.

Originally, I built this small antenna for local schedules on 80 meter CW, using less than 1 watt of power. Then, one night in November 1988, I was surprised to hear a Connecticut station calling me. Subsequently, I found that many distant stations could be worked on 1 watt. This led me to redesign the antenna, using thicker wire, and adjusting it to cover the other bands.

One time I was using this antenna in a three-way QSO on 30 meters. One of the stations became really hostile when I described my antenna, and did everything but call me a liar. He threatened to come to my home from Massachusetts and see my antenna himself. I told him to come along, but he finally got so upset he quit talking. It was one of the strangest things!

Construction

See Figure 1 for details. The plywood bottom piece is glued and nailed to the bottom of the vertical, 30-inch-long cross-piece. The vertical piece is 1 inch longer on the bottom to space it away from the plywood bottom piece. Attach the 29-inch cross boom to the vertical support piece. Starting from the edge of each support piece, cut seven ¼-inch deep grooves spaced about ¾-inch apart (see Figure 2). Angle the grooves so that the bottom of each groove is closer to the center point of the antenna. That way when the wire is wound around the support pieces, the grooves will keep the loop tight.

Drill a ⅛-inch hole ¼ of an inch above and below the seven grooves on the bottom portion of the loop. These holes are used to anchor the beginning and end of the wire loop. Cut a 37.5-foot length of #16 copper wire and loop one end through the bottom hole and run it down to the bottom attachment plate. Now loop the wire around through the grooves until you have 7 full turns in place. Run the end of the loop wire through the top support hole on the bottom support leg and tie it in place. A small wire loop can be placed through a hole in the very top piece of the antenna so that you can hang the antenna from the ceiling.

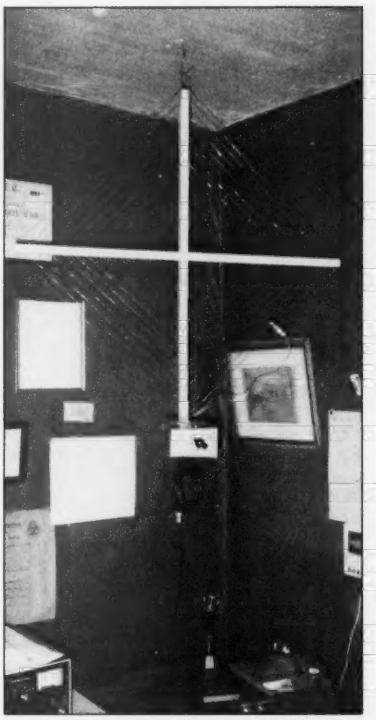

Photo B. The Pancake, over the operating desk. The tuning clip is in the 30m position.

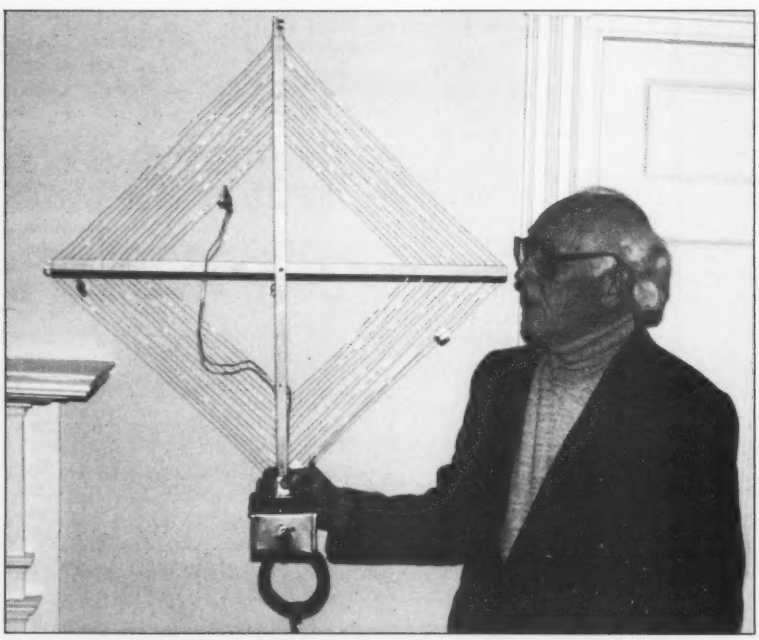

Photo A. The Square Pancake Antenna is a convenient indoor size.

The Tuning Capacitor

See Figure 2 for the tuning capacitor mounting details. Cut out a plywood support plate large enough to attach your tuning capacitor and the coax connector and mount it to the bottom of the vertical support piece. Mount the tuning capacitor to the bottom of the support plate and attach an SO-239 coax connector next to the back of the capacitor.

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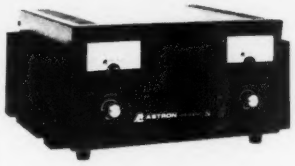

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SL-11A	•	•	7	11	2¾ x 7⅞ x 9¾	11

RS-L SERIES

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• POWER SUPPLIES WITH BUILT IN CIGARETTE LIGHTER RECEPTACLE				
RS-4L	3	4	3½ x 6⅛ x 7¼	6
RS-5L	4	5	3½ x 6⅛ x 7¼	7

RM SERIES MODEL RM-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• 19" RACK MOUNT POWER SUPPLIES				
RM-12A	9	12	5¼ × 19 × 8¼	16
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
RM-60A	50	55	7 × 19 × 12½	60
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50
RM-60M	50	55	7 × 19 × 12½	60

RS-A SERIES

MODEL RS-7A

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A		•	2.5	3	3 × 4¾ × 5¾	4
RS-4A	•	•	3	4	3¾ × 6½ × 9	5
RS-5A		•	4	5	3½ × 6⅛ × 7¼	7
RS-7A	•	•	5	7	3¾ × 6½ × 9	9
RS-7B	•	•	5	7	4 × 7½ × 10¾	10
RS-10A	•	•	7.5	10	4 × 7½ × 10¾	11
RS-12A	•	•	9	12	4½ × 8 × 9	13
RS-12B		•	9	12	4 × 7½ × 10¾	13
RS-20A	•	•	16	20	5 × 9 × 10½	18
RS-35A	•	•	25	35	5 × 11 × 11	27
RS-50A	•		37	50	6 × 13¾ × 11	46

RS-M SERIES

MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46

VS-M AND VRM-M SERIES

MODEL VS-35M

• Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H × W × D	Shipping Wt. (lbs.)
VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

RS-S SERIES

MODEL RS-12S

• Built in speaker

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	•	•	5	7	4 × 7½ × 10¾	10
RS-10S	•	•	7.5	10	4 × 7½ × 10¾	12
RS-12S	•	•	9	12	4½ × 8 × 9	13
RS-20S	•	•	16	20	5 × 9 × 10½	18

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

CIRCLE 16 ON READER SERVICE CARD

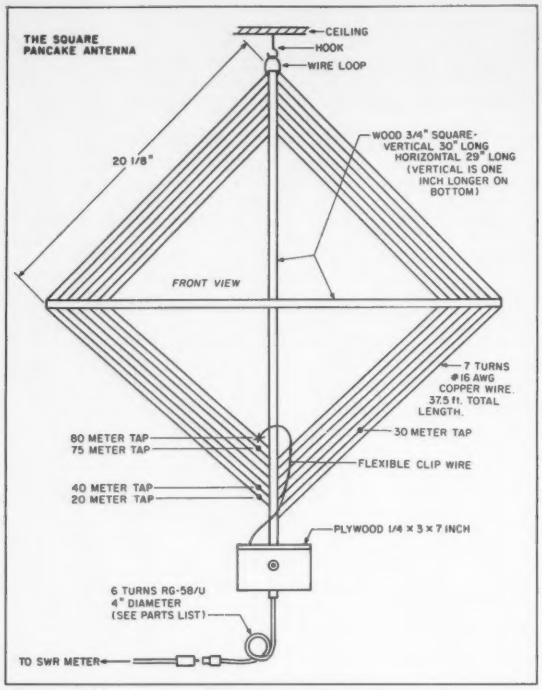
THE SQUARE PANCAKE ANTENNA
CEILING
HOOK
WIRE LOOP
20 1/8"
WOOD 3/4" SQUARE-VERTICAL 30" LONG HORIZONTAL 29" LONG (VERTICAL IS ONE INCH LONGER ON BOTTOM)
FRONT VIEW
7 TURNS #16 AWG COPPER WIRE. 37.5 ft. TOTAL LENGTH.
30 METER TAP
80 METER TAP
75 METER TAP
FLEXIBLE CLIP WIRE
40 METER TAP
20 METER TAP
PLYWOOD 1/4 × 3 × 7 INCH
6 TURNS RG-58/U 4" DIAMETER (SEE PARTS LIST)
TO SWR METER

Figure 1. Front view of the Square Pancake. Note: If there is any problem when tuning a specific band, try adding the optional jumper (dotted line on the figure) to the end of the loop wire.

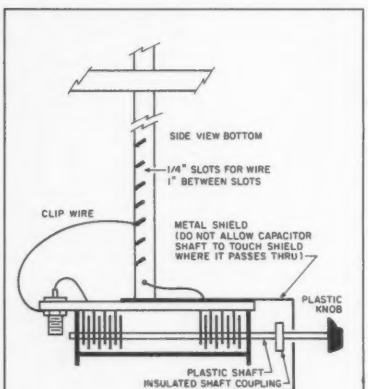
SIDE VIEW BOTTOM
1/4" SLOTS FOR WIRE 1" BETWEEN SLOTS
CLIP WIRE
METAL SHIELD (DO NOT ALLOW CAPACITOR SHAFT TO TOUCH SHIELD WHERE IT PASSES THRU)
PLASTIC KNOB
PLASTIC SHAFT INSULATED SHAFT COUPLING

Figure 2. Side and bottom view showing the tuning capacitor arrangement.

Wire the center pin of the connector to one end of the capacitor and hook up a 2-foot clip wire (alligator clip attached on the end) to the shield of the connector. This clip wire is used to tap the loop for the various bands of interest.

Make up a shield around the front of the tuning capacitor. (DO NOT allow the capacitor shaft to touch the shield. I coupled a plastic shaft and knob to the capacitor where it passes through the shield.) You can make the shield out of a piece of aluminum or tin from a coffee can. Cut a ¾-inch slot in the shield so that it can straddle the vertical stick. I drilled four small holes in the shield and used four small bolts to fasten it to the plywood piece. Very small wood screws would also work. Attach the bottom end of the wire loop to the front end of the capacitor.

If you don't want to hang the antenna from the ceiling, you could build a small, table-top cabinet for it; but you'd have to be careful to keep children and pets away from it when using it to transmit.

The 150 pF split stator capacitor is placed in series by allowing the rotor to float. This reduces the capacity to 75 pF and doubles the voltage. If you do not plan to run over 10 to 20 watts, you could use a wide-spaced single capacitor of 75 to 100 pF. If you can't find the capacitor at a hamfest, you can use a Millen #284130 dual section variable (12–115 pF); for lower power operation (under 50 watts) try a single section Millen #23100MK (7–100 pF). Both are available from Radiokit, P.O. Box 973, Pelham NH 03076. Phone: (603) 635-2235.

Reducing Loss

You can do several things to reduce the losses of this antenna.

Use larger wire. This will, however, change the tuning.

Look for a capacitor in which the plates are welded to the mounting bars and shaft. (I am not presently using a capacitor of this type, however.)

Place a rotary switch in the middle and wire it to the tap points. The switch contacts will still cause some losses.

My feeling regarding losses is to do the best with what you have, and give it a try. All antennas have some losses.

Tuning Up

The taps shown agree with my setup. Yours will probably be different. You'll have to find them during the tune-up process.

Do all your tune-up at as low an RF power as possible.

Attach the alligator clip to the 80 meter position (at the far end of the wire). The coax from your antenna should go to your SWR meter, and from the meter to your receiver or transmitter. Set the frequency desired. In this case it would be 3500 kHz. Another tap will be required for 3750 and 4000 kHz.

Slowly adjust the antenna capacitor until the noise or a signal increases in volume. If this doesn't occur at any capacitor setting, check your wiring. If this is OK, move the tap until it does take place.

Apply as small an amount of power as possible, and adjust the capacitor until the SWR is as close to 1:1 as you can get. The SWR should not be more than 1:2. If necessary, move the tap wire and tune for lowest SWR.

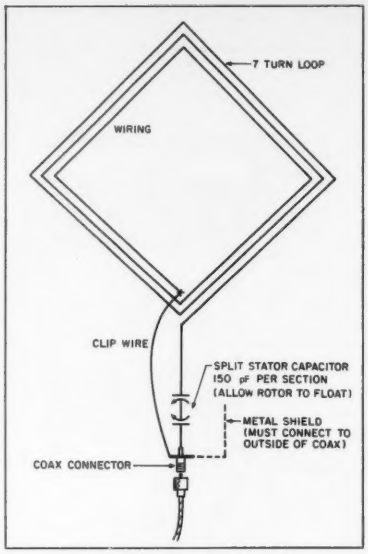
7 TURN LOOP
WIRING
CLIP WIRE
SPLIT STATOR CAPACITOR 150 pF PER SECTION (ALLOW ROTOR TO FLOAT)
METAL SHIELD (MUST CONNECT TO OUTSIDE OF COAX)
COAX CONNECTOR

Figure 3. Wiring the Pancake.

Once you find the tap point, you should only have to use the tuning capacitor to lower the SWR from about 3500 kHz to 3750 kHz. A new tap point will be necessary for the rest of the band.

Follow the same procedure for the rest of the bands.

If you make a frequency change of over 20 kHz, you'll have to use the capacitor to tune for lowest SWR; however, you shouldn't have to move the tap until about 3750 kHz, or when you can't achieve an SWR below 1:2 by use of the capacitor only.

Once the tap points have been found, mark them for future use.

Remarks

This design is not for outside use. A very high *Q* antenna such as this is not practical outside unless it's well-protected from the elements and you use some type of motor tuning.

There are HIGH VOLTAGES present on this antenna when transmitting. Keep this fact in mind at all times.

This antenna will arouse controversy among the VIPs of antennadom. Regardless of this, give it a try and decide for yourself. You can build the whole thing in about three hours with very little expense. 73

You may contact Ken M. Doolittle W2SMR, Box 553, Newark Valley NY 13811.

The Square Pancake Antenna

1	SO-239 coax socket	RS 278-201
6 ft.	coax and connectors	RS 278-975
38 ft.	#16 wire	solid copper
30 in.	¾ in. sq.	wood supports (2 pieces)
1	150 pF variable capacitor	split stator
1	Alligator clip	
1	Metal shield piece	

Misc: Plastic shaft and knob, coupler sleeve and necessary hardware.

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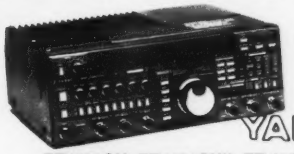

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FTH-2008/7008 IC2/4GAT/24AT
IC-A20/U16

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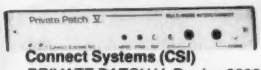
MAXON, MOTOROLA,
YAESU: FTH 2008/7008
UNIDEN, REGENCY, KING,
MARINE ICOM: M7, M56, M700
AVIATION ICOM: A20 H.T., TAD

IC-W2A | IC-H16/U16 | MOTOROLA RADIUS COMMERCIAL RADIOS | TH-77A | FT-470



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CIRCLE 41 ON READER SERVICE CARD

73 Review *by David Cassidy N1GPH*

Quantum Instruments, Inc.
1075 Stewart Ave.
Garden City NJ 11530
Tel. (516) 222-0611; Fax: (516) 222-0569
Price Class: Ham Battery $125, HT Adapters $30.

Quantum Ham Battery

Full power for your HT.

Any professional or serious amateur photographer is probably familiar with Quantum Instruments. For over eight years, Quantum has been the leading supplier of power packs to the photographic industry. Their products have been proven to be reliable, whether it's a wedding photographer snapping candids of a radiant bride, or a news photographer slogging through the jungles of South America. Photographers the world over rely on Quantum battery packs to supply full power in the field. Quantum Instuments has now brought their experience to the amateur radio market with the introduction of the Ham Battery.

The Quantum Ham Battery is a hefty (36 oz.) power pack that will provide full, 12 volt power to your HT. There are several things that make the Ham Battery different from the standard NiCd pack. First and most importantly, the Ham Battery is **not** a NiCd. The attractive black case contains a sealed lead acid battery rated at 12V and 2.1 Ah. Since the battery is designed for high current drain, it can handle up to 3 amps of current draw. Also, since the battery is not a NiCd, there is no problem with "battery memory." You can recharge the battery at any time, without the risk of shortening the battery life. Since the charging circuit is fully regulated, there is no danger of overcharging.

The other big difference in everyday use is that the Ham Battery does not attach directly to the bottom of your HT. The battery is hung on your belt with a built-in belt clip, or you can use an optional shoulder strap.. An adapter is plugged into the top of the Ham Battery; the other end replaces the battery pack on your HT. You can then use your HT as a speaker/mike, or you can leave your HT on your belt and use a regular speaker/mike. The adapter is so lightweight that with most mini-HTs, it is most convenient to use the whole radio, instead of having the additional tangle of a speaker/mike.

To test the effectiveness of the Ham Battery, I subjected it to several real-world situations (if you can call the Dayton Hamvention "real world"). The Ham Battery has three green LEDs which show the approximate state of charge. They are marked "1," "2/3" and "1/3" (with "1" meaning full charge, etc). Eight hours of constant monitoring and occasional transmitting never did more than put out the first light. Hooking my HT up to a wattmeter showed that I was getting a full 5 watts out at this level (my HT's maximum output at 12V). Every evening upon returning to the hotel, I plugged the wall charger in and woke up to a fully charged battery, without the worry of NiCd battery memory.

After doing this at three separate hamfests, I figured it was time to give the Ham Battery a tougher test. The opportunity came when my car went into the shop for some repairs and I was given a loaner. I threw the Ham Battery in a dash cubbyhole, stuck a 5/8 wave mag mount on the roof and set my sights at full battery drain. This set-up took me on a six-hour trip over the weekend, and back and forth to work every day (about 1 hour/day total) for a week—without a recharge. When I returned the loaner car a week later (and gratefully went back to a full 45 watts of output on my in-dash 2 meter gear), the "2/3" light was just starting to flicker. Granted, I probably didn't transmit as much as most people. I doubt that someone who is more of a rag-chewer than I am could repeat these results, but since you're probably never more than a full day away from an AC outlet, you could probably go for years without ever seeing that last LED go out.

The Ham Battery has two output jacks, so you can power two units at once (just don't exceed 3 amps draw). You can order a coiled power cord without an HT adapter, so you could power anything that takes 12V DC. This seems like the perfect power source for taking a QRP rig on that next wilderness camping trip. In fact, there's probably a hundred different ways you could utilize a highly portable 12V power source.

Come to think of it, I'll be spending a few days in a canoe in the backwoods of Maine this month. Hmmm. . . I wonder if DXCC has a special certification for QRP canoe maritime mobile? 73

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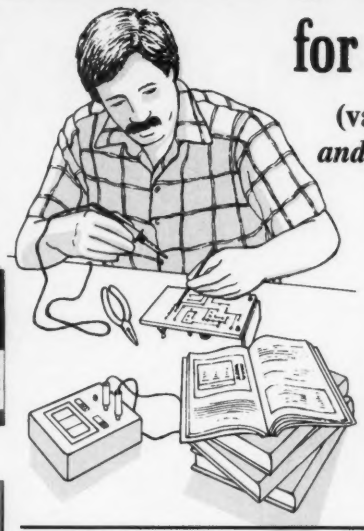

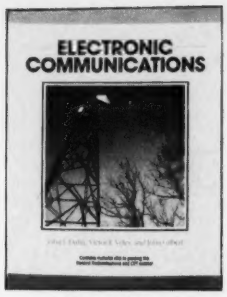

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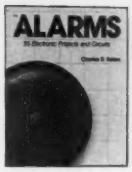

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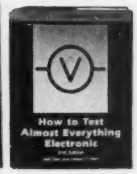

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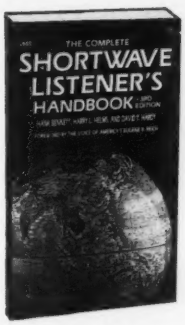

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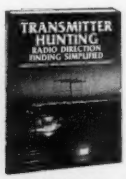

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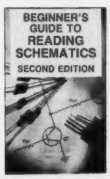

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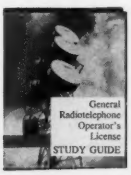

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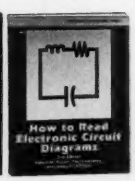

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CIRCLE 128 ON READER SERVICE CARD

Indoor 10 Meter Beam

A 2-element coaxial antenna.

by Jacquelyn J. McGlothlin N9CAP

In May 1981, I wrote "The 'No Antennas' Antenna," which appeared under my former name and call, Jacquelyn Schoewe WA9BBX. It was intended to shed some light on the problems many of us face when the landlord says, "No indoor antennas!" What do you do, give up your hobby? No way! You resort to an indoor, "invisible" antenna. What is not seen will not be noticed. From the mail I received, it appears that many of you tried the indoor coaxial dipole with great success. For those of you who wish to go one step further, here's an indoor, invisible coaxial beam that will improve your signal both ways. It requires only another length of coax to turn the original dipole into a beam.

The coaxial beam antenna has the same features as the coaxial dipole. It greatly attenuates harmonics, thus lessening any TVI problems. This antenna is also very broad-banded, covering the entire 10 meter band with a VSWR under 2:1 at band edges. The broad-band characteristics are due to the feedline being matched to the antenna and electrically incorporating its own balun. The coaxial beam antenna has a definite gain over a coaxial dipole, with 5–6 dBd being typical. It is also a very "quiet" antenna; the vinyl jacket reduces static charge build-up that can cause a popping noise in the receiver when discharged.

First, the Dipole

I'll begin with step-by-step construction of the 10 meter dipole, then modify it into a 2-element, 10 meter beam antenna. For antenna dimensions, see Figure 1.

Construction of the antenna is simple. RG-58A/U coax is best because it's light and flexible, but you can also use RG-8/U or RG-8X. Maximum legal power can be used with any choice of coax, providing the VSWR is under 1.5:1.

Begin construction by removing 1″ (2.5cm) of vinyl jacket (1/2″ on each side of center) at the center of the antenna. Cut the shield in the center all the way around the coax. Take care not to cut the dielectric or the center conductor. Next, form two leads with the shield, as shown in Figure 2. This is the feedpoint of the antenna.

From this center feedpoint, measure out each side of center 4′2″ (1.3 meters) and cut

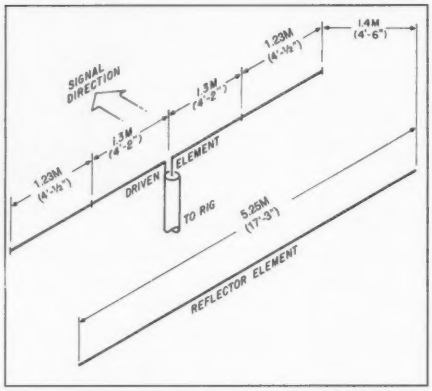

Figure 1. Element lengths for the 10 meter beam.

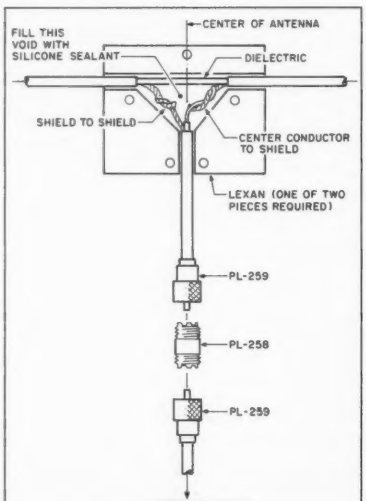

Figure 2. Feedpoint connection.

the coax at that point. Remove approximately 1″ (2.5cm) of vinyl jacket from each of the ends, and fold back the shield so that the dielectric is exposed. Cut and remove about an inch of this dielectric, being careful not to cut the center conductor. Then, twist the shield and center conductor together and solder. Do this at both ends. It forms the 52 ohm matching section and balun.

Next, cut two lengths of coax, each 4′ 1/2″ (1.23 meters) long. Then remove an inch of vinyl jacket from all four ends, fold back the shield, remove the dielectric, and twist the shield and center conductor together as before. This forms the end sections of the antenna. Attach one of these end sections to one end of the matching section by twisting together the prepared ends and soldering. In the same fashion, solder the remaining end section to the other end of the matching section. If you plan to install this antenna in an attic or outdoors, waterproof these joints as best you can. This will prevent any moisture from seeping in and deteriorating the coax. An easy method is to use heat-shrink tubing over the joint, heating it until it shrinks snugly, then wrapping it tightly with black vinyl electrical tape. Waterproofing the ends will come later, as they may need trimming for tuning purposes.

Attaching the Feedline

Refer to Figure 2. A short length of coax approximately 12″ (30cm) long will do, providing it is of the same type used for construction of the antenna. Remove about 1″ (2.5cm) of vinyl jacket from one end, fold back the shield, and remove the dielectric, being careful once again not to cut the center conductor. Form two leads with the shield and center conductor. At the feedpoint of the antenna, connect this feedline by soldering the feedline center conductor to one of the feedpoint leads. Then solder the feedline shield to the remaining lead. Waterproof this area if desired, being sure that the feedpoint leads do not touch each other and short out. One method is to cut two pieces of 1/4″ (6.5mm) thick Lexan or similar material into a 3″ x 4″ (7.5cm x 10cm) shape.

Using a router or hand chisel, remove enough of the material inside each half so that it will make for a snug fit over the feedpoint. Fill this area with silicone sealant such as RTV prior to sandwiching the halves together. Drill holes through both pieces at a few locations to allow for several screws, nuts, and lockwashers to hold the unit tightly together. Drill a hole at roughly the center top portion of this insulator block so that a small nylon rope may be passed through it for supporting the center of the antenna later. At the opposite end of the feedline, attach a PL-259 connector and a PL-258, also called a barrel connector. Then prepare a random length of

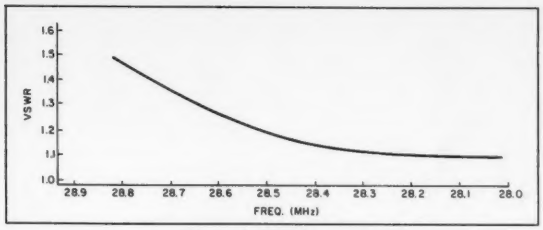

Figure 3. VSWR curve.

coax long enough to reach from the antenna to your rig and attach PL-259s to both ends. This will allow you to easily switch from one antenna to another, if desired, merely by unscrewing the feedline and attaching it to another antenna of your choice.

Erecting the Antenna

In choosing a location, be sure to allow enough room for an additional element running parallel to and approximately 4′6″ (1.4 meters) away from the antenna. It should also be oriented in your favorite direction, as indicated by the arrow in Figure 1. An attic or crawl space will provide ample room in most cases. Try to erect as much of it as possible in a straight line, keeping it as far away from large metal objects as feasible. The ends may hang down as long as they don't touch any nearby metal objects. Monofilament fishing line tied in a series of half-hitches along the vinyl jacket ends of antenna will do nicely for anchoring it. The line will bite into the vinyl as it is pulled taunt.

If you don't have an attic or access to one, the antenna may be stapled to a ceiling with plastic cable ties or any other non-conducting material as support. Wrap the cable ties around the antenna at intervals and staple the free ends of the ties to the ceiling. Do not staple directly through the antenna itself. Again, the ends may hang down if need be, providing they don't touch any nearby metal objects.

Tuning the Antenna

After erecting the antenna, check VSWR and trim the ends if needed, keeping track of the total amount trimmed. I used a design frequency of 28.5 MHz for tuning purposes. Be sure to twist the ends of the antenna as before (shield to center conductor), then recheck VSWR. The antenna will interact with any hidden wiring in the walls or ceiling, so a considerable amount may have to be trimmed from each end. Try to achieve a preliminary VSWR of 1.5:1 or 1.6:1 at the design frequency of your choice. This completes construction of the coaxial dipole at this point, so now we'll call it the driven element, and continue its transformation into a 2-element beam antenna.

The 2-element Transformation

The reflector element which we'll add requires only another length of coax, the same type used for construction of the driven element. To determine the length of the reflector, note the total amount, if any, trimmed from the driven element (you did keep track, didn't you?). Subtract this from the total starting length of 17′3″ (5.25 meters) to derive the actual length. This is the length required for the reflector element.

Cut a new length of coax to that dimension and prepare each end as you did with the driven element, then twist together as before (shield to center conductor). Erect this element in the same manner, being sure to align it parallel to the driven element and centered as best as you can so that an equal amount from each end extends beyond the ends of driven element. It should be placed 1.4 meters 4′6″ (1.4 meters) behind driven element for 0.13-wavelength spacing, or 9 feet (2.8 meters) for 1/4-wavelength spacing if you have the room for it. A slightly better front-to-back ratio will result. I had to use 0.13-wavelength spacing because of limited ceiling space, but it still provides overall good performance.

Now, check the VSWR again. You may find that it has risen from the last check, so trim the ends of the reflector element as needed, making sure you trim the same amount from driven element ends at the same time. Final VSWR checks run on the antenna at my QTH gave the results shown in Figure 3. Once you have gotten the VSWR down to an acceptable level, solder all four ends of the antenna and waterproof them if desired. This completes construction.

On-the-Air Results

Comparing the beam antenna to a coaxial dipole, there was a definite increase of 2 S-units, indicating a moderate gain of 5–6 dBd. Front-to-back ratio is not very much, so contacts off the back should be of sufficient signal strength for solid copy both ways. Should you desire to change direction of the antenna 180 degrees, you can convert the reflector element to a director element simply by trimming the ends so that it is 5% shorter in length than the driven element.

This is especially handy on 10 meters when winter European DX fades and summer South American DX predominates. If you like to experiment, a third director element 5% shorter than the driven element can be added for additional gain and front-to-back ratio. Or perhaps a 15 meter beam would appeal to you. Experiment! The possibilities are varied and intriguing!

With this antenna in use at my apartment QTH for over a year, I've been able to work many areas of the world with solid copy both ways that previously weren't strong enough to copy on the dipole for a QSO. Stations have expressed amazement or total disbelief about my antenna, but also provided some very interesting QSOs! Once you start enjoying the pleasures of DXing from your apartment or condo with an indoor beam antenna, I'm sure you'll raise many eyebrows, too! Happy DXing.

You may write Jacquelyn J. McGlothlin N9CAP, 2761A So. Logan Ave., Milwaukee WI 53207. Please enclose an SASE.

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Economical Mobile HF Antenna

Modify a CB antenna for the ham bands.

by John Portune AA6NG

When you think "mobile HF antenna," what comes to mind? Big and ugly? If so, you're normal. Little wonder so many hams have turned, in just the last three decades, to the convenience of VHF and UHF repeaters. Yet mobile HF still offers many advantages. On long trips and in remote areas, it is unequalled for fun and safety.

I couldn't bear the thought of a gigantic loading coil, a ball and a spring, on my new, small car. Fortunately, I found an answer. This article describes that solution—a modified commercially-built, base-loaded CB antenna. It has proven itself remarkably efficient, as well as an attractive partner to my diminutive new car and modern mobile transceiver.

Perfect for Modification

The current model Radio Shack 21-908A Trunk Lid Mobile CB antenna ($26.95) is ideally suited for conversion to HF. It has a loading coil that comes apart, making it easy to rewind, and is shunt-fed, making it easy to match. This second feature is very important.

In the past, HF rigs had output tuning networks which could match the low impedance of a mobile whip. Today, however, many mobile rigs are "no tune." They must see a 50 ohm load to function correctly. An antenna, therefore, must not only be tuned, but also impedance-matched, before it can accept power from such a rig. The preferred way is to add an additional small shunt coil from the feedpoint to ground. The Radio Shack antenna has this feature built in. A ball-and-spring setup does not.

Since modifying the first of several of these antennas, I have operated them on most of the ham HF bands, and have rarely been disappointed by an unanswered CQ. The little antenna has proven to be a winner.

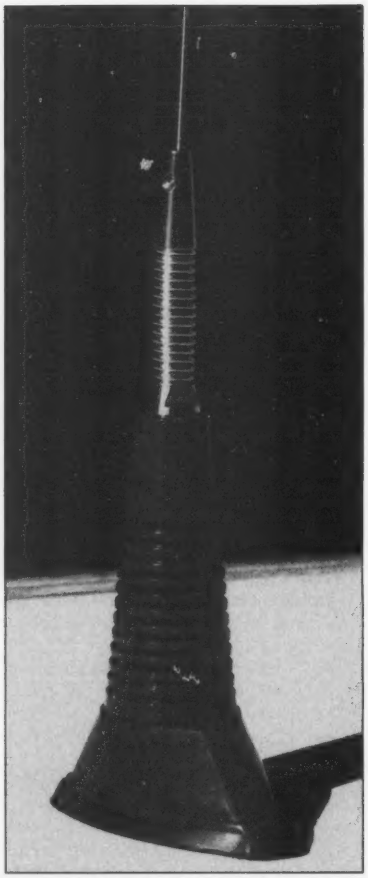

Photo A. This antenna is rugged, attractive, and easily mounted on the trunk lid. The whip may be adjusted in length by loosening the set-screw.

A Magnetic Mount Version

This same antenna also comes in a magnetic version, model 21-940. I had originally hoped to use it. But there is a problem. A magnetic mount relies on capacitive coupling to the car's metal body. It effectively adds (see Figure 1) a capacitor (Cm) in series with the antenna.

For 20 meters and higher, this is not a problem. But as the frequency gets lower, the reactance of this capacitor will eventually exceed 50 ohms. When it does, there is no 50 ohm tap point on the loading coil.

The trunk lid mount, with a real electrical ground, eliminates the problem. But if you are content with 20 meters and above, you

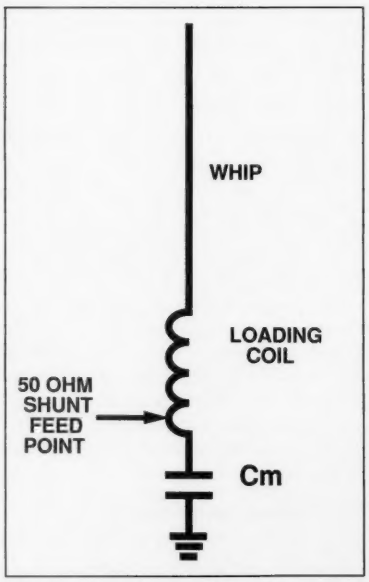

Figure 1. The circuit of the antenna on a magnetic mount. "Cm" is the effective capacity of the mount. At lower frequencies, the reactance of "C" exceeds 50 ohms, and impedance matching is not possible.

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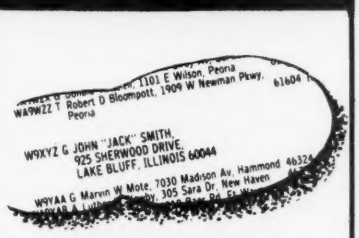
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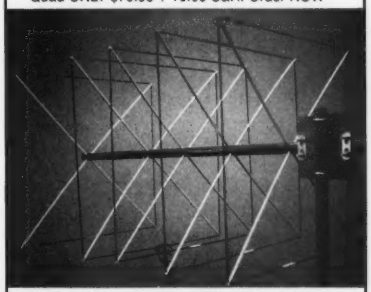

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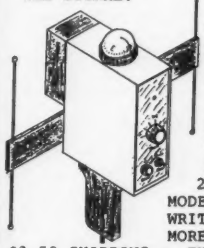

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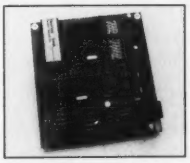

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CIRCLE 139 ON READER SERVICE CARD

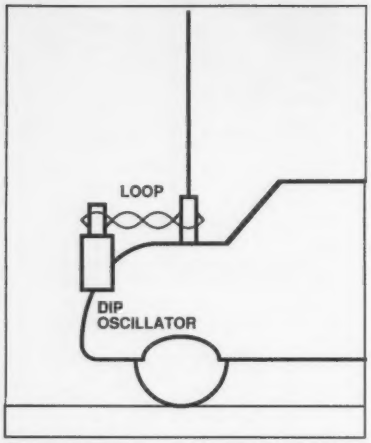

Figure 2. The resonant frequency of the antenna may easily be determined with a dip oscillator coupled to the antenna by a loop of twisted hook-up wire. Keep away from the antenna when dipping. The antenna feedline should be connected to the transceiver during the measurement.

may wish to use the magnetic mount. Some additional turns will have to be added to the coils, however, to counteract for the series capacity of the mount.

Modifying the Loading Coil

The loading coil is easily pushed out of the gray plastic housing for rewinding by pressing the threaded stud against a firm surface. Two well-placed O-rings protect the assembly from the weather. Be careful of these during modification, as they are easy to damage.

Notice that the coil has two sections. Tuning of the antenna is accomplished mostly by the upper coil, the impedance match by the lower. The feed from the center conductor of the coax is a shunt tap between the two coils.

The correct number of turns and wire gauge for each band is given in the table. The values are for the center of the band. Operation on 80 meters with this antenna is impractical due to the small diameter of the wire that is required.

You will also have to perform minor surgery on the plastic coil form. It comes with molded ridges to space the windings of the CB coil. For all but 10 meters, these should be removed with a coarse file or a hobby knife. A slight touch of the soldering iron will secure the new windings. Be sure to use the wire size listed. Also, wind all turns tightly together at the bottom. Different sizes of wire, or spaces between turns, will significantly change the number of turns required.

Tuning the Antenna

Once the completed antenna is assembled and installed on the car, tuning may be accomplished. This is not difficult, but it is touchy, owing to the size of the antenna. The smaller a loaded mobile whip, the narrower its operating bandwidth. Also, the bandwidth becomes more critical as the frequency goes down. On 10 meters the bandwidth is quite broad, but on 40 meters it is very narrow.

You will, therefore, have to slightly alter the number of turns on the loading coil for the specific spot on the band where you operate, especially on the lower bands.

A small amount of tuning is also possible during operation by adjusting the length of the whip. Use a turn or two less on the coil than for the frequency where you operate, with the whip all the way in. Then, by extending the whip, you will be able to lower the frequency to your precise operating point.

I leave a small SWR bridge in the feedline mounted near the transceiver. On low-power tune position, it is easy to find where the antenna is tuned—it's where the SWR is at a minimum. I then adjust the length of the whip until the antenna is perfectly tuned for my operating spot.

More Energetic Changes

If you wish to depart from the listed values more than a little, such as to build a version for a band not shown, you can use the help of a dip oscillator.

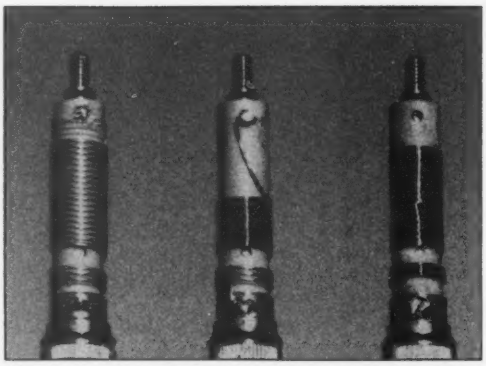

Photo B. Loading coils for three bands. Left to right are 10m, 20m, and 40m. Notice the spacing ridges on the 10m coil. Revolve these, and close wind coils for all other bands.

To do so, mount the antenna on the car and connect it to your transceiver (an open feedline will alter the operating frequency). Leave the gray plastic cover off of the loading coil during tuning.

Make a temporary coupling loop out of solid-conductor insulated hook-up wire, or from wire-wrap wire. See Figure 2. This loop will let you "dip" the antenna, to find its resonant frequency, without being too near it and changing its resonant frequency by body capacitance.

It is also a good idea to check out the test setup first with a known antenna, such as the stock CB version, before removing or adding turns.

First use your transceiver's receiver to verify the calibration of the dip oscillator on 10 meters. Then see if the stock antenna dips in the CB band (Channel 19 = 27.185 MHz). Then make a small modification to the coil. The dip oscillator will give you a fair indication of how far you have moved the resonant frequency. Repeat this process until you are inside the desired band.

You will then be able, using your transceiver and an SWR bridge, to locate the exact frequency that the antenna is resonant to. The SWR will be lowest at this frequency.

The necessary number of turns for the matching section of the loading coil is found by noticing how low you are able to get the SWR as you cross the band with a brief test transmission. Add or subtract a turn at a time until the SWR is near 1:1 at the resonant frequency of the antenna.

A Word About Power

Finally, be cautious about power. I use the antenna satisfactorily with an average 100 watt SSB mobile radio. But it is possible to exceed the power limitations of the antenna (the steady carrier power limit is 25 watts). The RF current in a short mobile antenna can be quite high, especially on the lower frequencies. Therefore, avoid more than brief key-down steady carrier situations. The loading coil could melt. Normal SSB voice transmissions will not be a problem.

An Attractive Compromise

Admittedly, from the purist's point of view, this little antenna lacks some in theoretical efficiency. A longer whip, a larger loading coil, or a capacitive hat would technically improve performance. But getting away from these is the object of the design.

By actual measurement, these changes would only offer minor improvement. To me, it's a small price to pay for the fact that I am one of the few in my ham circle who continues to enjoy HF mobiling in the days of tiny modern cars. The only drawback I've encountered is snide remarks from ham friends about a "good buddy" antenna on my car. They think I'm a traitor. I just smile and leave them in ignorance. 73

You may contact John Portune AA6NG at 724 Celestial Lane, Foster City CA 94404. If you request info, please include an SASE.

Turns Required on Loading Coil

Band	Upper Coil Turns (AWG)	Lower Coil Turns (AWG)
10m**	18 (*)	3.5 (*)
15m	21 (21)	3.5 (*)
20m	42 (21)	3.5 (*)
40m	82 (28)	5.5 (21)

*Existing AWG.
**Radio Shack recommends cutting the whip for 10m operation. However, the antenna will be more efficient if you rewind the coils according to this chart.

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MODEL	FREQ. RANGE	SENSITIVITY	DIGITS	RESOLUTION	PRICE
CT-50	20 Hz–600 MHz	<25 mV to 500 MHz	8	1 Hz, 10 Hz	$189.95
CT-70	20 Hz–550 MHz	<50 mV to 150 MHz	7	1 Hz, 10 Hz, 100 Hz	$139.95
CT-90	10 Hz–600 MHz	<10 mV to 150 MHz <150 mV to 600 MHz	9	0.1 Hz, 10 Hz, 100 Hz	$169.95
CT-125	10 Hz–1.25 GHz	<25mV to 50 MHz <15 mV to 500 MHz <100 mV to 1 GHz	9	0.1 Hz, 1 Hz, 10 Hz	$189.95
CT-250	10 Hz–2.5 GHz typically 3.0 GHz	<25 mV to 50 MHz <10 mV to 1 GHz <50 mV to 2.5 GHz	9	0.1 Hz, 1 Hz, 10 Hz	$239.95
PS10B Prescaler	10 MHz–1.5 GHz, divide by 1000	<50 mV	Convert your existing counter to 1.5 GHz		$89.95

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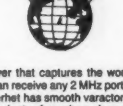

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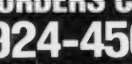

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CIRCLE 34 ON READER SERVICE CARD

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130. N7GLT
131. WA0X
132. KF4GW
133. N4QGH
134. VE1CBK
135. 7J1AAL
136. K6ICS
137. NZ7W
138. WB0N
139. WC7F
140. F6IFE
141. KL7N
142. KE8LM
143. WA6YOO
144. VE2MFD
145. N3APQ
146. HK1DBO
147. NM3V
148. IK6GFY
149. WB6UAN/M
150. NK6Z
151. KB6IUA
152. W9OKH
153. WB5FXT
154. NB3E
155. N2ESP
156. YU2EJU
157. OZ1DXX
158. IK5IIU
159. KA1ION
160. KD3AI
161. OK1AEH
162. W9LCR
163. 8P6SH
164. KA6SPQ
165. ZF2KH
166. W6MVV
167. JA8CAQ
168. KI6WF
169. K2MRB
170. AA6GM
171. JA0SU
172. NU8Z
173. G0GRK
174. YB8VM
175. DV1BRM
176. W0TU
177. N7CNH
178. PY3IO
179. YB0ZCA
180. YB0AF
181. VE3PQB
182. W2SV
183. N1ADE
184. WP4AFA
185. KS7V
186. W2OFB
187. G4ASL
188. N5JUW
189. KA8WAS
190. 5N0WRE
191. AA4IP
192. JR5KDR
193. KD2WQ
194. KA3NIL
195. WA8YWK
196. VE1ACK
197. HP2XVB
198. WB5KYK
199. N5JUJ
200. N4OBJ
201. 9Q5NW
202. KW2D
203. VE1HA
204. HP8BSZ
205. IK8JJQ
206. YC3DKN
207. I3VKW
208. K2EWA
209. KD3CR
210. N9GDG
211. KF8K
212. FD1BEG
213. DU1DZA
214. N8IMZ
215. KK4YA
216. LU1JDL
217. KA8YYZ
218. KA4TMJ
219. WA9DDC
220. YI1CIS
221. YC3FNL
222. G0FWG
223. KV4B
224. N5IET
225. WA9WIG
226. N3CDA
227. KE6KT
228. IK7DBB
229. JY5EC
230. N1ETT
231. PY2DBU
232. I8IYW
233. N0ISL
234. KC4BEB
235. WA7QQI
236. KA1RJG
237. OZ9BX
238. KB4HBH
239. KA3RWP
240. NJIT
241. W4DCG
242. YC0RX
243. VE7OJ
244. AA4W
245. N9GMM
246. KB4HBH
247. KM4HF
248. CE1YI
249. KA1FVY
250. N2GVB
251. N2DAO
252. WF8E
253. YB0HZL
254. N5MBD
255. N4SNS
256. KA3TGY
257. JN3XLY
258. N4DUV
259. KA9MRU
260. KA4OTB
261. N4JED
262. AB4KA
263. WA7OET
264. KA3RVH
265. CE7ZK
266. NI9J
267. WB9PTN
268. KB8DAE
269. W0CL
270. WB7VUB
271. JF6TUU
272. ZY3IO
273. KB4VIR
274. OE6CLD
275. N7JJQ/DU3
276. KK4FB
277. DU1AUJ
278. K2EWB
279. NI5D
280. N2JXC
281. N0IWT
282. WB3BDH
283. K1CVF
284. KA3CXG
285. KA1SPO
286. WA4NWT
287. KJ4OI
288. KA3UNQ
289. WB2VMV
290. KD4MM
291. OE3DHS
292. KD9HT
293. DL8OBC
294. G3KVA
295. WA4NEL
296. KA4VZO
297. N0IDT
298. KA1FUE
299. KD7EO
300. JH8MWW
301. KB8ICD
302. JA1CKE
303. N3GEE
304. JA5MG
305. KA1FTU
306. WA8KMK
307. N2IBW
308. N4THE
309. N3CYD
310. JA4TF
311. W6YLL
312. WA1S
313. KC5WA
314. N6WK
315. PY4OY
316. KG7BO
317. WB3FQY
318. WC0A
319. VE4AMU
320. YC0MCA
321. WA3LEU
322. KB2GLO
323. OZ1FNX
324. K6GCF
325. KC4PCX
326. KA7EXD
327. DK9EA
328. HL5AP
329. SM7BRO
330. ON6DP

150 COUNTRIES ENDORSEMENT

1. WB2DIN
2. N4WF
3. N6GCB
4. K9FD
5. N0AFW
6. N3II
7. WB1BVQ
8. KA2AOT
9. KI6GI
10. N7GMT
11. IK8GCS
12. IK1APP
13. VE6JO
14. VE4ACF
15. WB4I
16. IK1IYU
17. KE2CG
18. G3IZQ/W1
19. WB6FNI
20. K8MDU
21. VE6VK
22. KB6IUA
23. WB5FXT
24. YU2EJU
25. IK5IIU
26. KE8LM
27. KA1ION
28. KA6SPQ
29. W6MVV
30. JA8CAQ
31. KI6WF
32. JA0SU
33. WD5N
34. W2SV
35. W6BCQ
36. F6IFE
37. VE2MFD
38. WP4AFA
39. 5N0WRE
40. KD2WQ
41. VE1ACK
42. N5JUJ
43. 9Q5NW
44. KB8BHE
45. I3VKW
46. KD3CR
47. N8IMZ
48. G0FWG
49. N2FPB
50. KE6KT
51. OZ9BX
52. NJ1T
53. CE1YI
54. YB0HZL
55. JN3XLY
56. KA9MRU
57. CE7ZK
58. KB8DAE
59. K2EWB
60. NI5D
61. KD3CQ
62. KA4OTB
63. WB2VMV
64. KD4MM
65. KD9HT
66. KA3NIL
67. N0IDT
68. KA1TFU
69. KA4TMJ
70. JA4TF
71. KA3UNQ
72. KB8ZM
73. K2EWA
74. WA1S
75. PY4OY
76. WC0A
77. OZ1FNX
78. KA7EXD
79. ON6DP

200 COUNTRIES ENDORSEMENT

1. N3II
2. WB2DIN
3. K9FD
4. IK8GCS
5. N0AFW
6. WB1BVQ
7. VE4ACF
8. KI6GI
9. N6GCB
10. K8MDU
11. YU2EJU
12. KE8LM
13. WD5N
14. F6IFE
15. 5N0WRE
16. KE2CG
17. I3VKW
18. CE1YI
19. W6BCQ
20. CE7ZK
21. KB8DAE
22. K2EWB
23. KD3CQ
24. KD4MM
25. KD9HT
26. KA4TMJ
27. N7GMT
28. JA4TF
29. K2EWA
30. WA1S
31. PY4OY
32. ON6DP

250 COUNTRIES ENDORSEMENT

1. WB2DIN
2. IK8GCS
3. WD5N
4. K8MDU
5. KE2CG
6. CE1YI
7. CE7ZK
8. K2EWB
9. KD9HT
10. N7GMT
11. KD3CQ
12. KB8DAE
13. WA1S
14. PY4OY

300 COUNTRIES ENDORSEMENT

1. WB2DIN
2. IK8GCS
3. K2EWB
4. K8MDU
5. N7GMT
6. WA1S
7. PY4OY

350 COUNTRIES ENDORSEMENT

1. WB2DIN

ICOM BATTERY INSERTS

BP-2	7.2v	500mah	$14.00
BP-3	8.4v	270mah	$15.00
BP-5	10.8v	500mah	$21.00
BP-7	13.2v	500mah	$23.00
BP-8	8.4v	800mah	$21.00
BP-22	8.4v	270mah	$22.00

KENWOOD BATTERY INSERTS

PB-21	7.2v	200mah	$12.00
PB-21H	7.2v	600mah	$15.00
PB24 Tabs	9.6v	600mah	$15.00
PB-25/26	8.4v	500mah	$18.00

YAESU BATTERY INSERTS

FNB-3/3A	10.8v	500mah	$28.00
FNB-4/4A	12v	500mah	$27.50
FNB-10	7.2v	600mah	$15.00
FNB-11	12v	600mah	$30.00
FNB-12	12v	500mah	$30.00
FNB-17	7.2v	600mah	$18.00

MORE BATTERY INSERTS

Tempo S1 Early	270 mah	$19.95
Tempo S2/4/5 Late	500mah	$21.00
Standard BP-1	270 mah	$19.95
Ten-Tec BP1	500mah	$19.95
San-Tec #142/#144 Tabs	600mah	$22.00
Azden 300 Tabs	600mah	$15.00
Bearcat	600mah	$20.00
Regency MT1000 Tabs	600mah	$15.00

ICOM PACKS 2/4SAT & 24AT

BP-83S	7.2v	750mah	$38.00
BP-84	7.2v	1000mah	$50.00
BP-85s	12v	800mah	$60.00

* Add $3.00 Shipping FREE Catalogue

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279 Douglas Ave., Suite 1112
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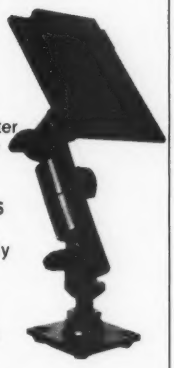
CIRCLE 62 ON READER SERVICE CARD

Townsend Electronics

RIG SAVER



- Allows you to safely mount your hand-held or mobile radio where you can see the controls.
- Vinyl coated adapter plate protects your radio.
- SlimLine **$24.95.** Heavy Duty **$29.95** + $3.00 S & H.
- Adaptable to nearly any vehicle or station use.
- Mounts on ANY single flat surface.

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CIRCLE 299 ON READER SERVICE CARD

SHORTY ALL-BANDER

THE PERFECT MATCH FOR ANTENNA TUNERS WITH A BALANCED OUTPUT

ONLY 70 FOOT LONG OVERALL

- Completely factory assembled ready to use
- Small, lightweight, weatherproof, sealed shorteners with stainless steel eyelets
- Heavy 14 (7/22) gauge stranded copper antenna wire to survive those severe storms
- Center fed with 100 feet of low loss 450 ohm balanced transmission line
- Includes center insulator with an eye hook for center support
- Includes custom molded insulators molded of top quality material with high dielectric qualities and excellent weatherability
- Complete installation instructions included
- Overall length 70 feet, less when erected as an inverted vee or sloper
- Handles 2 kw PEP & covers 160 through 10 meters
- May be trimmed to fit small city lots

Only $39.95 PPD

The ALL-BANDER DIPOLE, all-band doublet type antenna is fully assembled, overall length 135 feet with 100 feet 450 OHM feedline

Only $29.95 PPD

G5RV ANTENNA

The **G5RV MULTIBANDER** antenna is an excellent all band (3.5-30 MHz) 102 foot dipole. On 1.8 MHz the antenna may be used as a Marconi type antenna when used with a tuner and a good earth ground. The proper combination of a 102 foot flat-top and 31 feet of 300 ohm KW twinlead transmission line achieves resonance on all the amateur bands from 80 through 10 meters with only one antenna. There is no loss in traps and coils. The impedance present at the end of the 300 ohm KW twinlead transmission line is about 50-60 ohms, a good match to the 70 feet of RG8X mini foam coax. It comes completely assembled ready for installation, handles 2 KW PEP and may be used in a horizontal or inverted "V" configuration.

MODEL	BANDS	LENGTH	PRICE
G5RV-MB	80-10 (model illustrated)	102'	**$49.95 PPD**
G5RV (no xfmr or cable, with 31' bal. feedline)	80-10	102'	**$34.95 PPD**
G5RV JR (no xfmr or cable, with 26' bal. feedline)	40-10	51'	**$29.95 PPD**

AT YOUR DEALER, IF NOT, ORDER DIRECT

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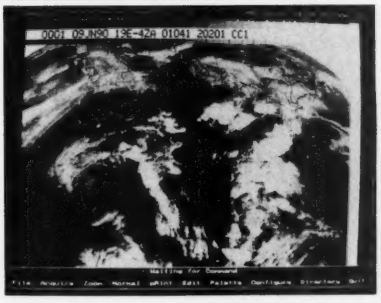
BOX 21305, S. EUCLID, OHIO 44121
PHONE (216) 481-6590 FAX (216) 481-8329

CIRCLE 120 ON READER SERVICE CARD



Receive Weather Satellite Images and Charts on your PC with Quorum's Totally Integrated and Affordable Weather Facsimile System

Quorum introduces the first totally integrated system for the reception of weather satellite images directly on your personal computer. Selection of HF NAFAX, GOES WEFAX, GOESTAP, METEOSAT, NOAA and METEOR APT (including satellite downlink frequency selection) are made under complete program control from your PC keyboard.

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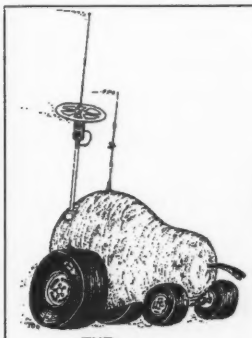
CIRCLE 24 ON READER SERVICE CARD

THE GREAT MOBILE PEAR



THE TEXAS BUGCATCHER
HF Mobile Antenna System

- Hi Q air-wound coils
- Minimum SWR—excellent performance on all HF bands
- Easy assembly to meet almost any configuration
- Fits standard 3/8-24 SAE mounts
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COMET
ANTENNAS FOR THE PROFESSIONAL AMATEUR

CPR-5800

Dual-Bander 146/446MHz
Gold plated center conductor for excellent electrical efficiency!

Wave Length: 146MHz 7/8 Wave
446MHz 5/8 Wx3

Gain: 146MHz 5.0dB
446MHz 7.6dB

Impedance: 50 ohms

VSWR: 1.5:1 or less

Max. Power: 120 watts

Length: 5'

Connector: UHF

CIRCLE 124 ON READER SERVICE CARD

Official DX Dynasty Countries List: 09/01/91

ABU AIL	A15
AFGHANISTAN	YAØ
AGALEGA ISLAND	3B6
ALAND ISLANDS	OHØ
ALASKA	KL7
ALBANIA	ZA
ALDABRA ISLAND	VQ9
ALGERIA	7X
AMERICAN SAMOA	KH8,AH8,(KS6)
AMSTERDAM ISLAND	FT4
ANDAMAN ISLAND	VU4
ANDORRA	C3
ANGOLA	D2,D3
ANGUILLA	VP2E
ANNABON ISLAND	3CØ
ANTARCTICA	KC4
ANTIGUA	V2
ANTIPODES ISLAND	ZL
ARAN ISLAND	EJØ
ARGENTINA	LU
ARMENIA	UG
ARUBA	P4
ASCENSION ISLAND	ZD8
AUCKLAND ISLAND	ZL9
AUSTRAL ISLANDS	FOØ
AUSTRALIA	VK
AUSTRIA	OE
AVES ISLAND	4MØ
AZERBAIJAN	UD
AZORES ISLANDS	CT2
BAHAMA ISLANDS	C6
BAHRAIN	A9
BAKER ISLAND	KH1,(KB6)
BALEARIC ISLANDS	EA6
BANABA ISLAND	T33
BANGLADESH	S2
BARBADOS	8P6
BEAR ISLAND	JW
BELGIUM	ON
BELIZE	V3
BENIN	TY
BERMUDA	VP9
BHUTAN	A5
BOLIVIA	CP
BONAIRE	PJ9
BONIN	JD1
BOPHUTHATSWANA	H5
BOTSWANA	A2
BOUNTY ISLAND	ZL
BOUVET ISLAND	3Y
BRAZIL	PP–PY
BRIT CYPRUS	ZC
BRITISH VIRGIN ISLANDS	VP2V
BRUNEI	V8
BULGARIA	LZ
BURKINA FASO	XT
BURMA	1Z
BURUNDI	9U
BYELORUSSIA	UC
CAMEROON	TJ
CAMPBELL ISLAND	ZL4/A
CANADA	VE
CANARY ISLANDS	EA8
CAPE VERDE ISLANDS	D4
CAPRI ISLAND	IC
CAYMAN ISLANDS	ZF
CELEBES	YB
CENTRAL AFRICAN REPUBLIC	TL
CENTRAL KIRIBATI	T3
CEUTA AND MELILLA	EA9
CHAD	TT
CHAGOS	VQ9
CHATHAM ISLAND	ZL
CHESTERFIELD ISLAND	FK8
CHILE	CE
CHINA	BY
CHRISTMAS ISLAND	VK9X
CISKEI	S4
CLIPPERTON ISLAND	FOØ
COCOS ISLAND	TI9
COCOS KEELING ISLAND	VK9Y
COLOMBIA	HK
COMINO ISLAND	9H
COMOROS	D6
CONGO	TN
CONWAY REEF	3D2
COOK ISLAND	ZK1
CORSICA	TK
COSTA RICA	TI
CRETE	SV9
CROZET ISLAND	FT8W
CUBA	CO
CURACAO	PJ
CYPRUS	5B4
CZECHOSLOVAKIA	OK,OL
DENMARK	OZ
DESECHEO ISLAND	KP5
DESROCHES	VQ9
DIEGO GARCIA	VQ9
DJIBOUTI	J2
DODECANESE ISLANDS	SVØ
DOMINICA	J7
DOMINICAN REPUBLIC	HI
EAST CAROLINE ISLANDS	KC6
EAST GERMANY	Y2–Y9
EAST KIRIBATI	T3
EASTER ISLAND	CEØ
ECUADOR	HC
EGYPT	SU
EL SALVADOR	YS
ENGLAND	G
EQUATORIAL GUINEA	3C
ESTONIA	UR,ES
ETHIOPIA	ET
EUROPA ISLAND	FR/E
FALKLAND ISLANDS	VP8
FAROE ISLANDS	OY
FARQUHAR	VQ9
FERNANDO DE NORONHA	ZYØ
FIJI ISLANDS	3D2
FINLAND	OH
FRANCE	F
FRANZ-JOSEF LAND	UA1
FRENCH GUIANA	FY
FUTUNA ISLAND	FW
GABON	TR
GALAPAGOS ISLAND	HD8
GAMBIA	C5
GEORGIA	UF
GHANA	9G
GIBRALTAR	ZB2
GLORIOSO ISLAND	FR/G
GOUGH ISLAND	ZD9
GOZO ISLAND	9H4
GRAHAM LAND	VP8
GREECE	SV
GREENLAND	OX
GRENADA	J3
GUADELOUPE	FG
GUAM	KH2,(KG6)
GUANTANAMO BAY	KG4
GUATEMALA	TG
GUERNSEY	GU
GUINEA	3X
GUINEA-BISSAU	J5
GUYANA	8R
HAITI	HH
HAWAII	KH6
HEARD ISLAND	VKØ
HONDURAS	HR
HONG KONG	VS6
HOWLAND ISLAND	KH1,(KB6)
HUNGARY	HA
ICELAND	TF
IFNI	EA9
INDIA	VU
INDONESIA	YB,YC,YD,YE
IRAN	EP
IRAQ	YI
IRELAND	EI
ISCHIA	IC
ISLE OF MAN	GD
ISRAEL	4X,4Z
ITALY	I–IZ
IVORY COAST	TU
JABAL ATTAIR	??
JAMAICA	6Y
JAN MAYEN ISLAND	JX
JAPAN	JA
JARVIS ISLAND	KH5J,(KP6)
JAVA	YCØ
JERSEY	GJ
JOHNSTON ISLAND	KH3,(KJ6)
JORDAN	JY
JUAN DE NOVA ISLAND	FR/J
JUAN FERNANDEZ ISLAND	CEØ
KALININGRAD	UZ2
KAMARAN ISLAND	VS9
KAMPUCHEA	XU
KAREN NATIONAL UNION	1Z9
KAZAK	UL
KENYA	5Z
KERGUELEN ISLAND	FT8X
KERMADEC ISLAND	ZL1/K
KINGMAN REEF	KH5K
KIRGHIZ	UM
KOREA	HL,HM
KURE ISLAND	KH7
KUWAIT	9K
KWAJALEIN	KX6
LABRADOR	VO2
LACCADIVE ISLANDS	VU7
LAMPEDUSA ISLAND	IG9
LAOS	XW
LATVIA	UQ
LEBANON	OD
LESOTHO	7P
LESSER ANTILLES	PJ
LEVANZO ISLAND	IF9
LIBERIA	5L
LIBYA	5A
LIECHTENSTEIN	HBØ
LINE ISLANDS	T3L
LITHUANIA	UP
LORD HOWE ISLAND	VK9
LUXEMBOURG	LX
M-V ISLAND	4J
MACAO	XX
MACQUARIE ISLAND	VKØ
MADAGASCAR	5R
MADDALENA ISLAND	IM
MADDONA DE MONTE IS	IL
MADEIRA ISLAND	CT3
MALAWI	7Q
MALAYSIA	9M2
MALDIVE ISLANDS	8Q
MALI	TZ
MALPELO	HKØ
MALTA	9H
MANIHIKI	ZK1
MARCUS ISLAND	JD
MARIANA ISLAND	KHØ,(KG6)
MARION ISLAND	ZS2
MARKET REEF	OJØ
MARQUESAS ISLAND	FO/M
MARSHALL ISLAND	V73
MARTIM VAS ISLAND	PYØ
MARTINIQUE	FM
MAURITANIA	5T
MAURITIUS ISLAND	3B8
MAYOTTE	FH
MEXICO	XE
MIDWAY ISLAND	KH4,(KM6)
MINAMI TORI SHIMA	7J
MIQUELON ISLAND	FP8
MOLDAVIA	UO
MONACO	3A
MONGOLIA	JT
MONTSERRAT	VP2M
MOROCCO	CN
MOUNT ATHOS	SY
MOZAMBIQUE	C9
NAMIBIA	ZS3
NAURU	C2
NAVASSA ISLAND	NP1
NEPAL	9N1
NETHERLANDS	PA
NETHERLANDS ANTILLES	PJ2
NEVIS ISLAND	V47
NEW CALEDONIA	FK1
NEW HERBRIDES	YJ
NEW ZEALAND	ZL
NEWFOUNDLAND	VO1
NICARAGUA	YN1
NICOBAR ISLAND	VU4
NIGER	5U
NIGERIA	5N
NIUE ISLAND	ZK2
NORFOLK ISLAND	VK9
NORTHERN IRELAND	GI
NORWAY	LA
OGASAWARA ISLAND	KA2
OKINO TORI SHIMA	7J
OMAN	A4
PAKISTAN	AP
PALMYRA ISLAND	KH5
PANAMA	HP1
PANTELLERIA ISLAND	1H
PAPUA NEW GUINEA	P2
PARAGUAY	ZP
PENGUIN ISLANDS	ZS9
PERU	OA
PETER 1ST ISLAND	3Y2
PHILIPPINES	DU–DZ,4F
PHOENIX	T3P
PITCAIRN ISLAND	VR6
POLAND	SP9
PONZIANI ISLAND	IBØ
PORTUGAL	CT
PRINCE EDWARD ISLAND	ZS2
PRINCE EDWARD ISLANDS	VE1
PRINCIPE	S9
PRIVILOF	KL7
PROVIDENCIA ISLAND	HKØ
PUERTO RICO	KP4
QATAR	A7
RAPA ISLAND	FO8
REUNION ISLAND	FR4
REVILLA GIGEDO ISLAND	XF4
RODRIGUEZ ISLAND	3B9
ROMANIA	YOØ
RONCADOR CAY	HKØ
ROTA ISLAND	KHØ
ROTUMA ISLAND	3D2
RUSSIA-SIBERIA	UAØ
RUSSIAN S.F.S.R.	UZ6
RUSSIAN-URAL MT	UZ9
RWANDA	9X
RYUKYU ISLAND	JR6
SABA ISLAND	PJ7
SABAH	9M6
SABLE ISLAND	CYØ
SAIPAN	N6
SAKHALIN ISLAND	RFØ
SAN ANDRES ISLAND	HKØ
SAN FELIX ISLAND	XQØX
SAN MARINO	T7
SAO TOME	S9
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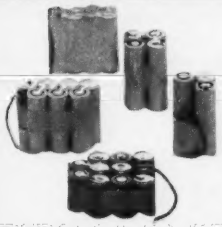

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CIRCLE 191 ON READER SERVICE CARD

73 Review *by Bill Clarke WA4BLC*

Carolina Beam

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Several years ago, I reviewed the Carolina Windom antenna. It was an excellent antenna for general use, and I've worked considerable DX with it and its cousin, the 160 Carolina Windom. The 160 lets me operate top band, as well as all the other bands. Of course, a tuner is required for all band operation with Windom type antennas.

In keeping with a fine tradition of well-designed wire antennas, Jim Thompson W4THU has introduced another innovative version of the Windom antenna. This new version has an updated, dedicated matching unit (balun), and bent wire elements.

Installation

The Carolina Beam is about as simple to install as any antenna I have seen to date. Just take it out of the package, clip a few cable ties, and unroll everything. It is completely built and you only have to attach the feedline, tie ropes to the insulators, and pull it into the air. My time was 20 minutes from "out of the package" to "on the air."

I do recommend that the end vertical legs be weighed down to keep them from moving in the wind. A one-pound lead weight will suffice nicely.

Coax-Seal™ is provided to weatherproof cable ends. Use it!

Performance

As standards for comparison, I used my 40/80 meter double-edged sword (a single feedline dipole with legs for 40 and 80 attached at the feedpoint) at 35 feet, and a 160 Carolina Windom (over 250 feet long) at 48 feet, in drooping configuration. Both antennas have been in place for over a year, and their performance on the bands is a known quantity.

I placed the Carolina Beam at 40 feet. Using good quality coax switches, I was able to make fast changes between the antennas.

My first observation was that the Carolina Beam hears as well as it talks. When a received signal was better on the Carolina Beam, the outgoing signal was better than that from the dipole or the Windom.

- 80 meters: As good as the dipole in all cases, and about 10 dB better than the 160 Windom for local work.
- 40 meters: Same as the dipole and same as the Windom.
- 30 meters: Same as the Windom in 90% of my contacts. Remainder slightly better.
- 20 meters: 50:50, with no clear winner. This is probably due to the distinct pattern differences between the Windom and the Carolina Beam. Having both to select from made a real difference in making DX contacts.
- 17 meters: In all cases, the Carolina Beam outperformed the Windom by 5 dB or better, except for one contact that was about 5 dB below the Windom (I really cannot say why).

Specifications

Length of horizontal portion: 84'*
Frequency: 80–10 meters
Radiator lengths: see diagram
Feedline: 50Ω coax
Wire: #14 stranded (7 x 22), hard-drawn
Matching method: DMU and transmatch
Power rating: 1500 watts
Minimum height: 30'*
Radials: not required

*The Carolina Beam can have the 32' element reduced to only 16' by changing the location of the support rope (the attachment insulator is factory installed on all Carolina Beams). This will increase the overall length to 100', but allow a lower height. Note: I didn't try this modification during the evaluation.

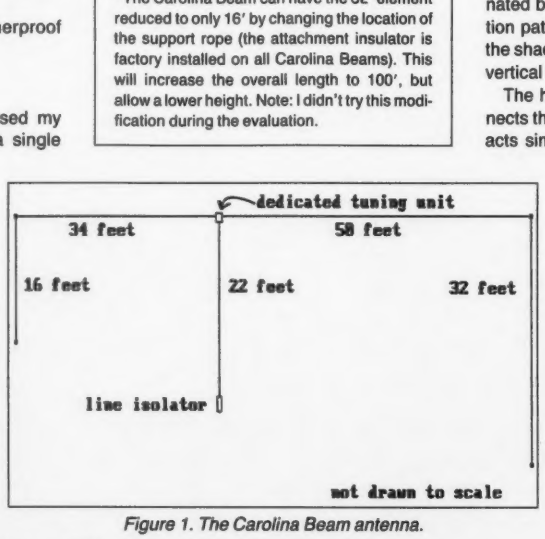

Figure 1. The Carolina Beam antenna.

- 15 meters: As with 20 meters, this band was quite variable.
- 12 meters: A distinct low-angle worker. The Carolina Beam always outperformed the Windom by at least 5 dB.
- 10 meters: Same as 12 meters.

It was interesting to note that there was little difference in signal reports from my station, compared to others using towers with directional beams (located near my QTH). The ionosphere is a great equalizer.

This antenna can be stretched out into a standard Windom configuration if you so desire. However, for the life of me I cannot understand why anyone would want to do it. By the way, Jim tells me the reverse is NOT true. Bending a standard Carolina Windom to look like a Carolina Beam will not result in Carolina Beam performance. The matching units are different.

How It Works

As with all Carolina Windom based antennas, the Carolina Beam is designed to create feedline radiation. This is induced by an unbalanced condition caused by the dedicated tuning unit. The feedline radiation is terminated by the line isolator to control the radiation pattern and to keep unwanted RF out of the shack. Thus, the coax feedline becomes a vertical radiator.

The horizontal portion of the antenna connects the three vertical radiators together and acts similar to a ground plane with inverted vertical elements.

Unlike trap antennas, the Carolina Beam radiates from all elements over the length of the entire structure on all bands. Because both vertical and horizontal elements are present, there is a good mixture of high and low angle radiation.

The Carolina Beam does require the use of an antenna tuner. However, most solid-state rigs require a tuner anyway to keep the SWR from shutting them down.

Pattern Plots

The radiation pattern plots accompanying this article were made

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FL-53A 250 Hz CW filter (2nd IF)	115.00	**109.95**
FL-70 2.8 kHz wide SSB filter	59.00	
IC-735 HF xcvr/SW rcvr/mic	1149.00	**969.95**
PS-55 External power supply	219.00	**199.95**
AT-150 Automatic antenna tuner	445.00	**389.95**
FL-32A 500 Hz CW filter	69.00	
EX-243 Electronic keyer unit	64.50	
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using the Carolina Beam installed at a 50-feet height over average ground. I used the ELNEC program for computer analysis, output to a Canon laser printer.

Azimuth plots are shown for the angle of elevation which gives the maximum signal (the angle is indicated at the lower right corner). Plots for the WARC bands are not included, as they nearly duplicate other nearby bands. The 75 meter azimuth plot was perfectly omnidirectional, and therefore is not included.

My Comments

I am impressed by the Carolina Beam. It is a small antenna that is able to stand up to much larger systems. The entire package is precut and ready to go in the air. It comes with a dedicated tuning unit, RF line isolator, insulators installed at all points, and a pre-made primary vertical radiator (coax).

While not really a beam in the sense that most hams envision, and not giving the directional performance that you expect from a 3-element tribander at 70 feet, the Carolina Beam is a very workable antenna. It does not cost near what a tower, beam, and rotor would.

The Carolina Beam will fit into a space just over 80 feet in length, and give full 80 meter dipole performance. This is something for the small-lot ham to think about.

The Carolina Beam is about as close to one antenna do-all as you will ever get. For those with very limited space, Radio Works produces a cut-down version of the Carolina Beam, which requires only 42 feet of horizontal space and covers all bands from 40 through 10 meters.

As well as a good choice for a home station antenna, I personally think the Carolina Beam and other Windom-type antennas, are excellent for Field Day exercises. They are certainly more convenient than towers and beams! 73

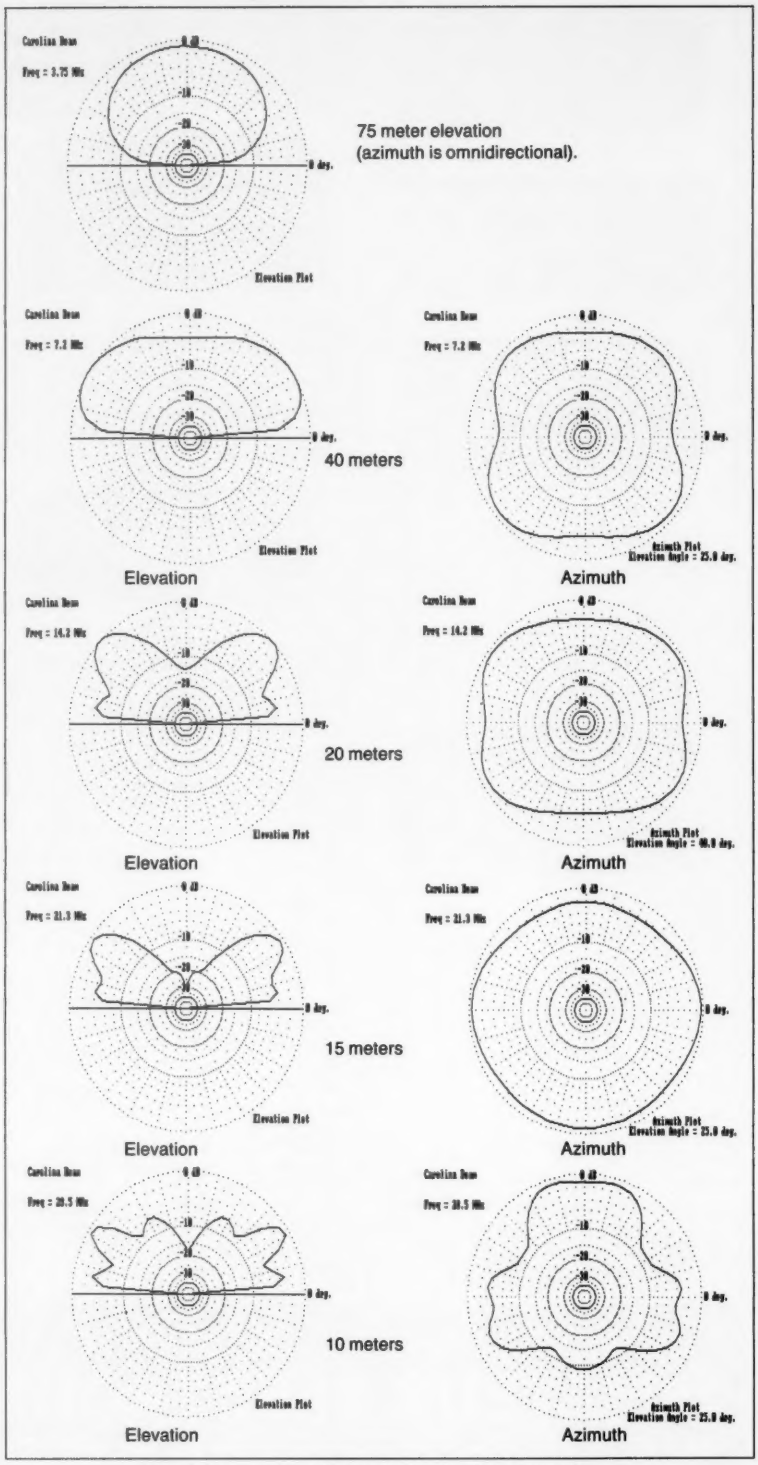

Figure 2. Elevation and Azimuth plots for the Carolina Beam.

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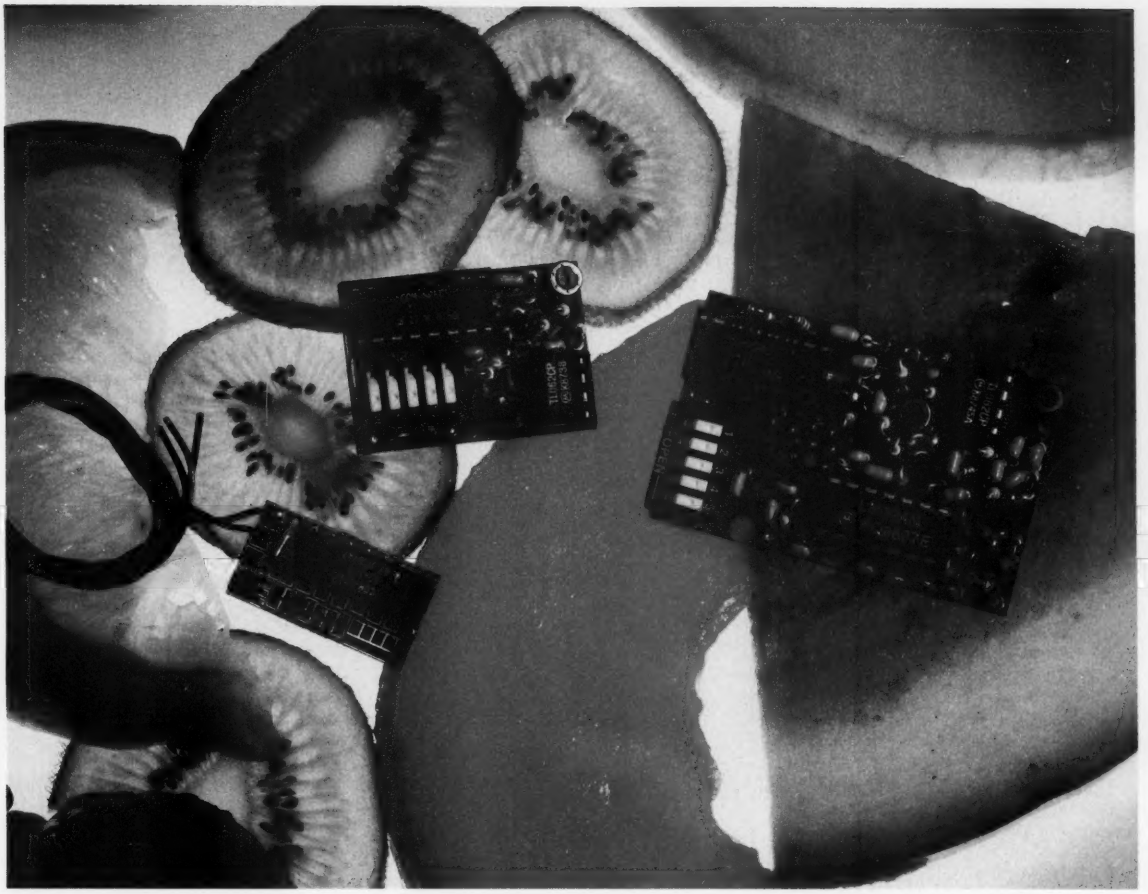

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CIRCLE 10 ON READER SERVICE CARD

Dual-Band Vertical

For the 160 and 1750 meter bands.

by David F. Curry WD4PLI

Using a TV push-up mast, you can get surprising ground wave radiation from small vertical antennas (30 to 50 feet high) for the 1750 and 160 meter bands. Good antenna performance is critical; the antenna must be resonant with your operating frequency for transmission, and have a good ground system.

FCC regulations state a maximum-50 foot limit in the 160 to 190 kHz bands for both the feedline and antenna. Even with strict limits such as these, transmission and reception of ground wave signals from several hundred miles away are possible at low power levels of only 1 watt.

Many amateur operators would like to try this low band, but they can't find a good design for an antenna. A 160 meter antenna could easily be matched to work the 1750 meter band, but its dimensions might exceed the legal limits. In this article, I offer a good compromise, opening opportunities for someone with space restrictions.

Antenna Description

The basic antenna assembly is in three parts: the top hat and 160 meter loading coil, the push-up mast upper and lower section, and the loading/relay system for antenna matching.

The capacity hat is the key to good radiation resistance and low angle radiation for 160 meters, and greatly improves the efficiency on 1750 meters. The size shown in the picture is 10 feet in diameter, with a wire ring around the perimeter. The wire ring further increases capacitance, adding to overall efficiency.

The telescopic portion of the antenna is a galvanized steel push-up mast you can buy at almost any Radio Shack, electronics or possibly hardware store. Select the length that suits your requirements. A 40-foot mast seems to be a good compromise of rigidity and height vs. price.

Final matching will be done at the antenna site, using a relay for dual-band operation (not required for single-band operation), and a capacitor/inductor combination.

On the 160 meter band, the antenna is current-fed by the loading inductor just under the capacity hat. The actual antenna resonance is lower than the frequency of interest, and therefore must be electrically shortened by a series capacitor at the base of the antenna. The capacitor should be preferably an air dielectric, such as a large transmitting variable from 50 to 500 pF. A vacuum variable would also be ideal. The larger the tuning range of the variable, the greater the frequency swing across the 160 meter band. The capacitor connects between the antenna and the center of the coax lead, and is tuned for minimum VSWR. With the loading coil near the top of the antenna, most of the current will flow to the top, which is desired.

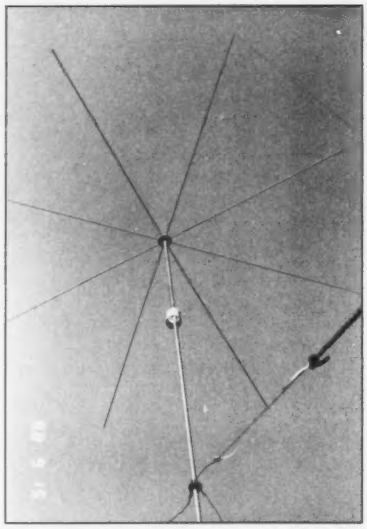

Photo. The dual-band vertical showing the capacity hat and top-loading coil.

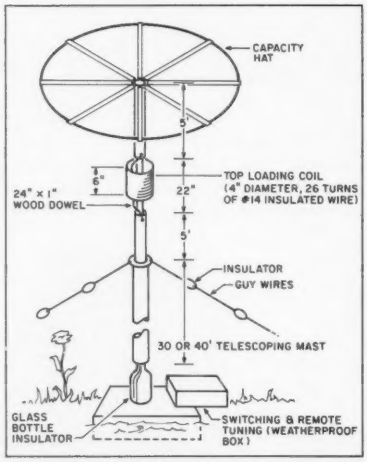

Figure 1. Overall dimensions of the dual-band vertical.

1750 meter operation is very different, as this antenna is extremely short at these frequencies. With the size of capacity hat described, a top-loading coil would be very inefficient due to the high amount of inductance required, and the subsequent I^2R losses from the resistance of the wire. A much larger capacity hat would be required, and would involve consulting your neighbors! Instead we will voltage-feed the antenna using a large prehistoric-size loading coil at the base, and use a tap point on the coil to match it to a low impedance source (transmitter).

By using the capacitive reactance to tune the coil to resonance as a part of the antenna capacitance, the coax actually becomes part of the antenna matching system. This offsets the 50-foot antenna and feedline restriction by turning the coax from a non-reactive transmission line to a reactive component that is part of the tuning circuitry.

The loading coil L1 in Figure 7a can be a regular air-wound inductor, with the number of turns found experimentally. Or you could use a variometer (see the sidebar) that would greatly ease the tuning procedure.

Construction

Remember before starting that the top loading coil just below the capacity hat can be eliminated if you plan to operate only on 1750 meters.

The capacity hat is made of eight aluminum tubes, each 5-feet long and ¼-inch thick, purchased at a local hardware store for about a dollar a foot (see Figure 2). At the end of each tube, press a ½-inch area flat with pliers, and drill a small hole to accommodate a

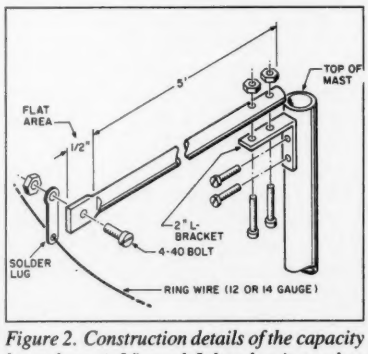

Figure 2. Construction details of the capacity hat tubes. A 2" steel L-bracket is used to attach each tube to the mast. Run a wire ring through the far ends of the tubes to form a large circle (solder the wire ring at the end of each tube).

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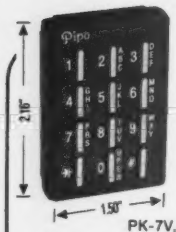

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4-40 nut and bolt. Use a solder lug so that the ring wire can be soldered securely after the solder lug is tightly fastened with the nut and bolt to the aluminum rod. This makes it easy to install the wire ring. At the other end of each tube, attach a 2-inch steel L-bracket. Drill 8 holes equidistant around the top end of the mast pipe so that the capacity hat tubes can be attached. Mount each tube to the mast as shown in Figure 2.

When you attach the top hat, be sure to twist each rod so that the solder lug at the end will be in a vertical position. The wire chosen as the ring wire should be of large solid variety, and can be insulated. String the wire through each solder lug hole, but not too tight. Clip and solder the end of the wire, and each remaining solder lug, with ample solder. Spray your favorite color of paint on the entire capacity hat assembly for weatherproofing, or paint marine varnish over all sections.

The top loading coil for 160 meters is constructed from 4-inch diameter white PVC pipe, about 5 inches long. 30 turns of #16 gauge stranded wire, Teflon™ insulated, is used for the initial inductor. You could use other coil-form material, such as Plexiglas™. Avoid black-colored PVC tubing!

Wind the coil tightly and paint it with Fiberglas resin. Use solder lugs to secure each end of the coil, and 6-inch wires to connect the coil to the top and bottom mast.

The top section of the mast is five feet of galvanized steel tubing, exactly like the top section of the telescopic vertical. The exact length is not critical since the coil can resonate to almost any reasonable length, but lengths beyond 10 feet can break due to wind resistance. Three to seven feet are recommended. *[Ed. Note: If you use a 40 or 50-foot telescoping mast for the antenna, you can cut the top 10-foot section in half to use as the top section.]*

When painting the coil, also paint a wooden dowel rod that's about one foot long and fits easily into each vertical section. The idea here is to provide good insulation and solid strength for the top section of the vertical and capacity hat. The wooden dowel works very well for this, and should be inserted into the top of the push-up mast after curing.

Final Assembly

Now you may have to make a big decision. Shall it go on the roof or in the yard?? It should be in the clear as much as possible, of course! Absorption from trees and surrounding structures can foul up an antenna of this type. Also, you have to consider a ground system after raising the antenna. Insulated radials (as many as practical) at 50-foot lengths should radiate from the antenna base in equal directions. On roof installations, use either radials, hot and cold water pipes (especially copper ones!), or chicken fence mesh. Many times a combination of these will do an adequate job, especially for the city dweller.

After you've determined the antenna site, make preparations for the insulated base. Many approaches can be used, but the old glass bottle trick works every time, and is

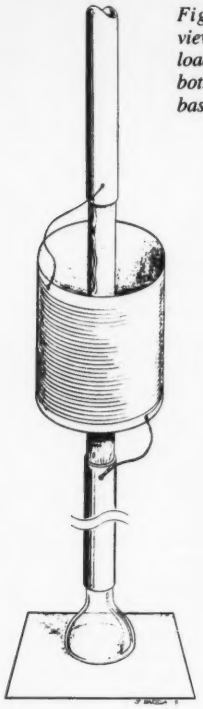
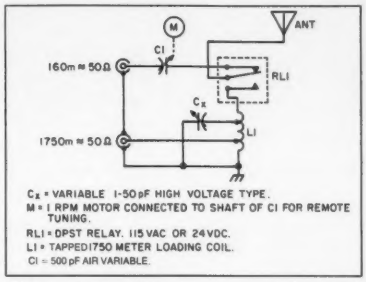


Figure 3. Close-up view of the 160m top loading coil and glass bottle insulator for the base.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Cx
LI
1750m ≈ 50Ω
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Figure 4. Switching arrangement for dual-band operation.

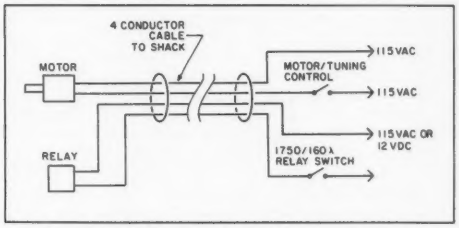

Figure 5. Cable connections for remote tuning.

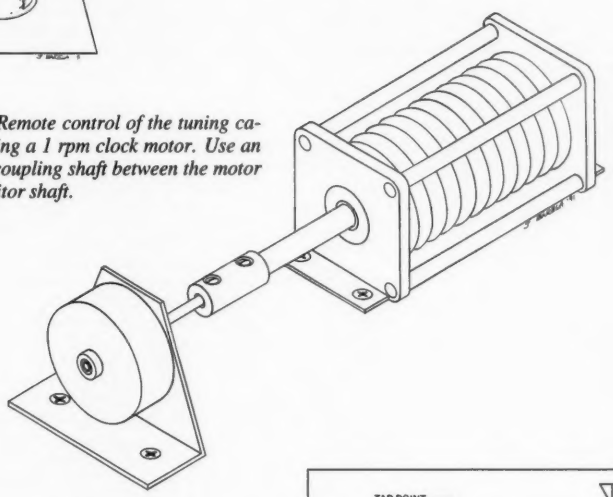

Figure 6. Remote control of the tuning capacitor using a 1 rpm clock motor. Use an insulated coupling shaft between the motor and capacitor shaft.

recommended. The bottle is simply placed in cement that has been prepared and drying. Insert the bottle about four inches into the cement. The cement may be poured into a hole in the ground, for ground installations. A vent pipe can be used for roof mount, but a strong solid insulator, such as a Plexiglas or Teflon rod, must be used as an insulated support. Plastic companies usually carry this product. Alternatively, a cement block can be used with a glass bottle for roof mounts. The guy cables are ¼-inch polypropylene rope which are adequate but need replacement every couple of years.

The collapsed mast is placed over the insulator and guyed at the 10-foot section. Additional guys are attached, usually at the 30-foot section.

If steel guy wire is used, be sure to use ceramic egg insulators, two per guy to insulate the vertical. Very high voltages exist

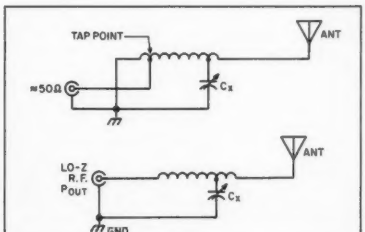

Figure 7. (a) Proper matching to 50 ohm coax. (b) Direct connection to the transmitter at the antenna site.

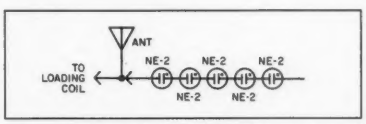

Figure 8. Neon bulbs soldered in series and connected to the antenna. When they reach maximum brilliance, the antenna is resonant.

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Variometer Construction

A variometer provides an easy way to match low frequency antennas, such as vertical radiators, random length horizontal, or "L" shaped wire antennas, and resonate these at a desired frequency.

A variometer can be thought of simply as two inductors that can slide in and out of each other. Depending on the size of the inductor coil forms, the number of turns, and the size of wire used, the inductance will vary as the magnetic fields of both coils either aid or cancel each other as the two coils are moved within each other's proximity.

One of the coils can be made small enough to rotate inside the larger coil, and the magnetic flux can be added or subtracted by rotating the inside coil. To do this, both coils must be connected in series. The variometer is wired so that the smaller rotating inductor is connected within the large outer one. Optimum efficiency will occur when both coils aid or add to each other for maximum inductance.

During initial calibration, after rotating the inside inductor to resonance, it may be beneficial to remove wire from the variometer. This is especially desirable from the standpoint of higher efficiency and better *Q*.

The whole point of the variometer is to find the ballpark resonance of your antenna system, then optimize the variometer by removing or adding turns, if required.

Assembly

First, wind the large coil form.

Usually, a range of 5–8 mH for a 30–50 foot vertical antenna will be within the 1750 meter limits. A vertical antenna such as this should also have at least a 5-foot capacity hat for improved radiation resistance. Wire gauges from 18 to 26 work well, with the small gauge wire providing more turns per inch and more inductance. Number 22 gauge wire does a fine job overall, and you'll need at least 200 feet.

Two small holes, one at each end of the coil form, is used for terminating each end of wire after winding.

Tape one end of wire with masking or Scotch™ tape to, or near, a hole at the end of the coil form. Sit in a chair or couch with the form in your lap. The spool of wire should be on the floor, leading up to the form.

Turn the form with one hand and use the other hand to guide the wire taunt against the form. A tight, even layer is required. After 20 or 30 turns you might want to stop and push the turns closer, if required.

Masking tape will hold the turns in place when you stop. In the middle of the form are two 1/4-inch holes directly opposite each other, with a small hole next to each one. Wind the turns carefully around these holes so that you don't block them, because the holes will be used later on in assembly.

A 4-40 screw with a solder lug can be installed at the end hole to terminate the wire. The insulation should be removed with fine sandpaper or a stripping chemical, and then inserted through the eye of the solder lug and twisted. Make sure that there isn't any slack that could loosen the turns of the wire. Repeat this procedure for the other end of the coil using a 4-40 screw and nut, and a solder lug terminal. If desired, a spray varnish can be used to add weatherproofing and protection. Use only a clear varnish or enamel.

Now wind the smaller coil form in a similar fashion. Because this form is so small by comparison, it may not be necessary to take the same precautions as before. The only major difference is the way the wire is installed in the form itself. (See the figure.)

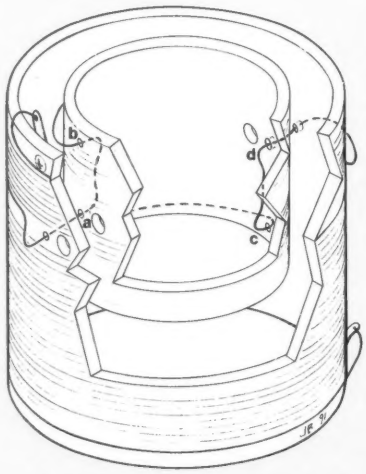
At this time, varnish or spray enamel may be used to protect the inside coil.

The final step in the assembly is to install the small coil inside the larger one, and wire the two inductors together. Locate the nylon threaded rod and nylon nuts. Push the rod through one end of the large coil and screw a nut on. Turn the rod and advance the nut, then screw on another nut. After an inch or so, place the smaller coil form inside the larger one, and place the end of the rod into the 1/4-inch hole in the center of the small form. Continue to turn the rod so that it advances into the small coil form and add another two nuts on the nylon rod. Continue turning the rod so that it can go through the small coil form, and add one more nut. A total of six nuts are used, with four of them holding the smaller coil directly in the center. Tighten the nuts with FINGERS ONLY! The rod should extend completely through the large coil, with one end longer to provide a knob to turn it with. At this end, add the last nut on the outside of the large coil, and screw it so it is tight with the inside screw, centering the small coil and providing a small amount of friction so that the small coil won't slip.

Take the wires from the small coil and lead each wire through the small holes on the larger coil form.

These two wires should follow closely to the nylon rod, and have no kinks or twists.

Once fed through the small holes on the large form, clip the excess wire so that only 1/4 inch remains extending from the large coil form. Remove the enamel so that each wire is clean for soldering.



The diagram shows that the wire is first fed backwards out of the hole (A), and down the inside toward the center (B), and then outside with approximately 3–4 inches remaining. This remaining end will go through the small hole at the center of the large coil form later. With the wire at (A) and (B) installed, wind the form completely, being sure to leave an open space around the 1/4-inch holes at the end. Push tightly all turns so that the most wire possible can fit on the form. Before cutting any wire, add approximately two feet, after inserting the wire through the hole (C). Now, cut the wire and feed it through hole (C), down inside toward the center and through hole (D), to the outside.

At this point, cut the wire on the large coil, where it goes between the two 1/4-inch holes. This will be right in the middle of the coil, and will be easy to locate since it is a single wire in between the upper and lower sections.

If no varnish has been applied to the larger coil, you will need to add tape over the upper and lower sections so the turns will not become loose after you cut the wire. Each of the cut wires should be trimmed back and soldered to one of the wires from the inside coil. Snip the wires from the larger coil and solder, one on each side, to the 1/4-inch wires on each side from the small rotating coil. Allow a small amount of slack on the inside wires for rotation.

Operation

The variometer is connected between the ground systems and the antenna, usually with a tap point several turns up from the ground side that connects to the transmitter and/or receiver.

For systems involving only a receiver, simply rotate the small coil of the variometer at the frequency of interest and note a peak in reception. If there is no peak in signal strength, then it is entirely possible that resonance is occurring elsewhere. Remove turns from the top of the outer coil if required.

For transmitting purposes, remove as much wire as possible from the outer coil after the frequency has been determined and experimentation has located the variometer's point of resonance. Measure either the RF voltage across the 50 ohm load with an oscilloscope or RF voltmeter, or the RF current to the 50 ohm load. Note the value.

Monitor the radiated RF level and turn the variometer control to resonate the antenna. A receive monitor, field strength meter, or a small neon bulb placed near the antenna is useful for this. Antenna voltage can be very high. Avoid touching the antenna while tuning.

Note the current or voltage at the tap point. When the antenna is resonant, this should be the same value as that of the 50 ohm resistor. If the current is lower, go down on the tap point toward the ground end. For voltage measurements that are low, raise the tap point higher, away from ground. Re-resonate the antenna every time you change the tap point.

An optimum point will be reached where the tap point will have the same voltage and/or current, as was noted with the 50 ohm resistor, when the antenna is a resonance. Using a nonreactive 50 ohm load as a reference makes it very easy to adjust transmitters and antennas on 1750 meters.

Sophisticated equipment, such as an oscilloscope, is handy, but a small Ne-2 bulb will suffice in a pinch. Several Ne-2 bulbs soldered together in series will also work as a reference for monitoring voltage across the antenna. This is only for reference and does not indicate antenna efficiency.

Sometimes there may be difficulty in rotating the inner coil due to rubbing between the two. Adjusting the four screws that secure the inner coil will either expand or contract the coil center. Wire turns around the coil form sometimes warps the form slightly. Placing pressure will compensate for this. After this is done, set the two nuts on the outer coil form to gently hold the inner coil in the center.

A complete variometer kit is available (not including wire) for $68.95 postpaid from: Curry Communications, 852 North Lima Street, Burbank CA 91505.

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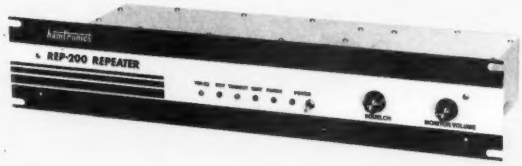

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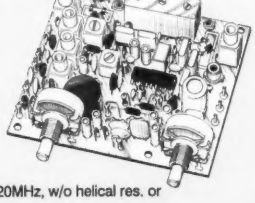

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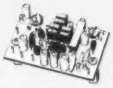

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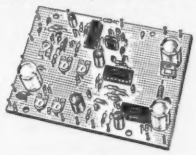

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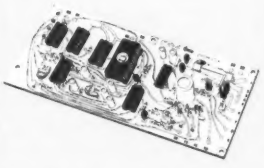

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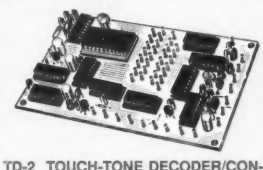

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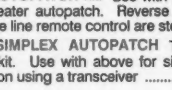

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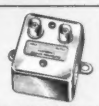

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CIRCLE 153 ON READER SERVICE CARD

when you use the antenna on 1750 meters, and high voltages exist on the capacity hat on both 160 and 1750 meters. You'll need a ladder next to the vertical, and rigid gloves to raise each section. Insert the wooden dowel with the top-loading coil placed about two inches above the mast.

With two small screws, bolt the coil to the side of the dowel. Clean the top of the mast in a small area. The wire from the bottom of the coil is soldered at this point. Place the top vertical and capacity hat section on the dowel rod, and clean it for soldering to the top of the loading coil. Raise the top section of the mast and tighten the section after being extended. Raise the next section and secure this after being fully extended. After all sections have been raised, check the guys and adjust the antenna into a vertical position.

You can add strength to the vertical joints by drilling ¼-inch holes through each joint and securing them with a nut and bolt through the smaller hole where the cotter pin is usually located. These masts can be quite flimsy when you're raising them. Be extra careful around power lines.

Loading Coil and Matching

Figure 4 shows remote switching and tuning of the antenna. A 1 rpm motor (M) is connected to capacitor C1 (Figure 6). Relay RL1, a power relay, will withstand at least 220 volts. This is required since high voltages exist with this type of antenna on 1750 meters. Using these will provide easy control right in the comfort of your own shack!

160 Meter Calibration

Connect an SWR meter between the transmitter and antenna. Place the transmitter into the transmit position, using low power in a clear portion of the 160 meter band that will be the frequency of interest.

Rotate the capacitor and notice the SWR meter for a dip. If no dip is indicated, try a lower or higher frequency. The top loading coil may need turns removed or added to facilitate tuning and lowest SWR. Capacitance of C1 lower than 50 pF should be avoided.

Poor ground systems will also deteriorate the lowest possible SWR. Shorting C1 will cause the antenna to resonate at its natural resonant frequency, which should be around 1750 kHz. The capacitor shortens the wavelength of the antenna into the 160 meter band, but a point of no-return can happen if the natural resonant frequency of the antenna is much lower than 1750 kHz.

1750 Meter Band Operation

Three to seven mH will be required to resonate this antenna on 1750 meters. A variometer (see the sidebar) is a convenient way to find resonance and match the antenna. Figure 7a shows proper matching to a coax, and Figure 7b can be used for direct connection to a transmitter at the antenna site. The coil in Figures 7a and b is tapped approximately five turns from the ground end, and can be found by simulating the tap point with a 50 ohm load.

Tune-Up

Transmit a signal on the desired frequency into a 50 ohm load and note either the current or voltage across to load. Replace the load with the tap point at the antenna site, and resonate the antenna by varying the inductance of the coil. Capacitor Cx is a 25 pF (value not critical) high voltage variable that is temporarily inserted to aid in finding the ballpark frequency resonance of the antenna, in case it's off-frequency. Cx should be removed or minimized for best efficiency. Adjust Cx and then add or remove turns on L1 until Cx becomes a very small value or not required at all.

Monitor the signal strength with a remote receiver or field strength meter. Figure 8 shows several neon bulbs soldered in series that are connected to the antenna. As the antenna approaches resonance, the bulbs begin to shine brighter. Once our aim, maximum brilliance, has been reached, note the current or voltage at the tap point. If there is a difference between this value and the value noted across the 50 ohm resistor, change the tap point and re-resonate the antenna. Do this procedure several times until the antenna is resonant and the SAME value is indicated at the tap point as with the value noted with the 50 ohm resistor.

This is the relative 50 ohm tap point on the loading coil, when the antenna is resonant at that specific frequency. The reactive element of the coax is absorbed by resonating the coil and antenna, providing a part of the total matching system. The direct coil method in Figure 7b can be used for beacon transmitters (for example), with the loading coil ground end connected instead to the transmitter output.

The loading coil can be made by using a large coil form, about six inches in diameter and 10 inches long, wound tightly with #18 gauge enameled wire. Plexiglas or white PVC tubing is excellent for this application. You'll have to experiment to find the exact amount of inductance required for antenna resonance. It is easy to accidentally resonant the antenna on the second harmonic. Check the signal with a receiver on both fundamental and harmonic frequencies to confirm power output on the fundamental frequency.

A car battery box (or any weatherproof enclosure) can be used to house the capacitor, relay and 1 rpm motor. The coil should be located in the clear with a coat of marine varnish after installation is complete.

Check out information on mobile 160 meter antennas for an understanding of how 1750 short verticals operate. They are very similar in principle. These short vertical antennas offer reliable results, and they're a good compromise of size vs. performance. 73

You may reach David F. Curry WD4PLI at 852 N. Lima Street, Burbank CA 91505. The owner of Curry Communications, David offers a variometer kit for this project for $68.95, postage paid.

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CIRCLE 67 ON READER SERVICE CARD

The L-O-N-G Long-Wire

Helpful hints to build your own DX-buster.

by Stan Gibilisco W1GV

Many times on the air I have heard folks tell me they are using a long-wire antenna. When I hear this, I always wonder if they really do have a long-wire, or if they are just using an end-fed wire. At high frequencies, a true long-wire antenna requires some real estate. You might say that a wire is not truly "long" unless it exhibits noticeable gain and directional characteristics. Generally, this requires a length of two wavelengths or more, and at low frequencies this can be quite long!

Although it requires a lot of space, the long-wire antenna may be unobtrusive, and a good choice for the ham with a limited budget and an affinity for the lower frequency bands—20 meters and longer. This article describes the long-wire I put up, largely with the encouragement of local hams, and some hints for making things go as smoothly as possible. Murphy loves long-wire—there's so much to tangle up and snag—but he can be at least partly outsmarted. The obsessive/compulsive, hard-core antenna fanatic can win. With just one helper, I put up my 880-foot radiator despite a partly crippled right arm and wind chills considerably below zero Fahrenheit. Little things like that, and having to slither down a dangerously steep and slippery embankment, were not enough to intimidate an antenna fanatic such as myself.

Encouragement from the Net

Due to medical reasons, I had come back to Rochester to stay with my parents, whose home has great vantage points toward the north and west. A friend let me use his spare rig, an FT-101EE, and helped me put up a modest "long wire." This antenna worked well, but there was far more real estate available: an undeveloped piece of land measuring at least 800 by 800 feet (250 meters square). Why not put up a real long-wire?

But the land wasn't going to stay vacant; there was talk of it soon being bulldozed and built up. Besides, I'd be moving back out on my own in a few months. Putting up a long-wire would mean stringing 600 to 800 feet or more of wire. I was half-enthusiastic, thinking that the antenna might not last long.

But then, I thought, since when is anything permanent? One ice or wind storm can prove that no antenna is forever. If the antenna can be used for three months, that's three months more than no time. I decided not to fall for what I call "the impermanence excuse."

One friend on the local 10 meter net said he'd put up a real long-wire once, and had never regretted it; he encouraged me to go for it while I had the time and space. And so I did. Putting up an 880-foot long-wire was hard work, but it was worth it.

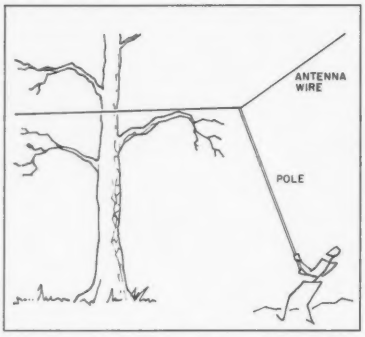

Figure 1. A long pole may be used to push the wire up higher when it is snagged on a tree.

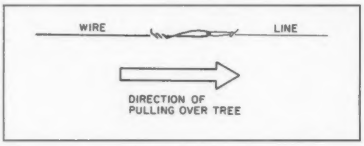

Figure 2. Attaching fishing line to the end wire with a "streamlined" knot minimizes the chance of snagging.

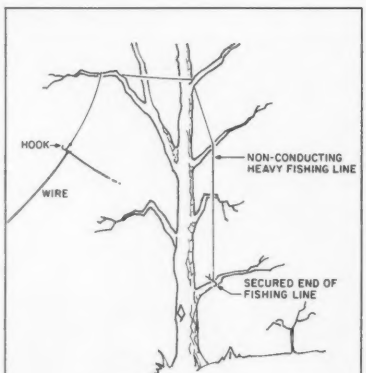

Figure 3. Raising the antenna wire as it passes near a tree may also be done if the wire gets snagged.

Snagaroo, and Other Goodies

If Murphy's laughs can be heard by madmen, there must have been a worldwide disturbance just before my first romp in the snowy, undeveloped land. The wire chosen was AWG #15 hard aluminum fence wire, available at a local farm supply store for $13.49 for a quarter of a mile (0.4 kilometer). Aluminum was chosen because it is almost as good a conductor as copper, but much lighter, and a far superior conductor to the steel wire also found in cheap abundance. As it was, steel would have been impossible to handle anyway; the stress on the wire was enough to pull me over several times.

It is truly remarkable how a twig as small and fragile as a toothpick can keep a gigantic, quivering, straining length of metal wire ground-bound against the efforts of one or even two men. If any passersby had heard my grunting and profanities on these numerous occasions, I'd have been committed straight away.

But vector physics provides a good explanation. The force of even 100 pounds of tension on a wire is nothing compared to one pound exerted laterally near the center of the span. Try pulling a long-wire as tight as you can, and then marvel at how, pushing it lightly in the middle with your little finger, you can displace it sideways several feet or meters. This principle was later used to advantage.

At first, though, I had to walk along the length of wire, free it from innumerable snags on bushes and small trees, pull the wire tight again, then trek along under it in the snow, tripping over small irregularities in the terrain and going down—poof—into the powder like a stuffed doll, muttering as I spit out snow and twigs. By this time it was too cold for loud swearing.

When the wire got caught in a branch too high to reach, I used a pole to push it up (Figure 1). The technique for very tall trees was to throw a line over the whole tree, or shoot it over with a bow and arrow—first watching out for kids playing or grownups hiking—and pull it up with a miniature grappling hook attached to the other end of the line.

Problems and Lessons

Using the bow and arrow method, we anchored the wire at its destination up over a tree. Here, Murphy had another golden opportunity to have some fun. Some problems that occurred were:

1. The wire snapped. I don't know how solid #15 gauge aluminum wire could break from less stress than my own body weight—140 pounds in full winter gear—but it did, somewhere up in the tree (of course), so that another weighted arrow had to be shot, the

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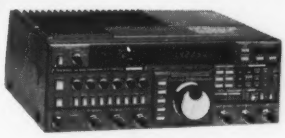

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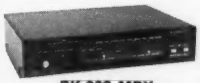

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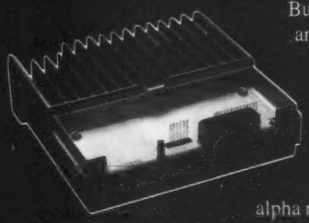

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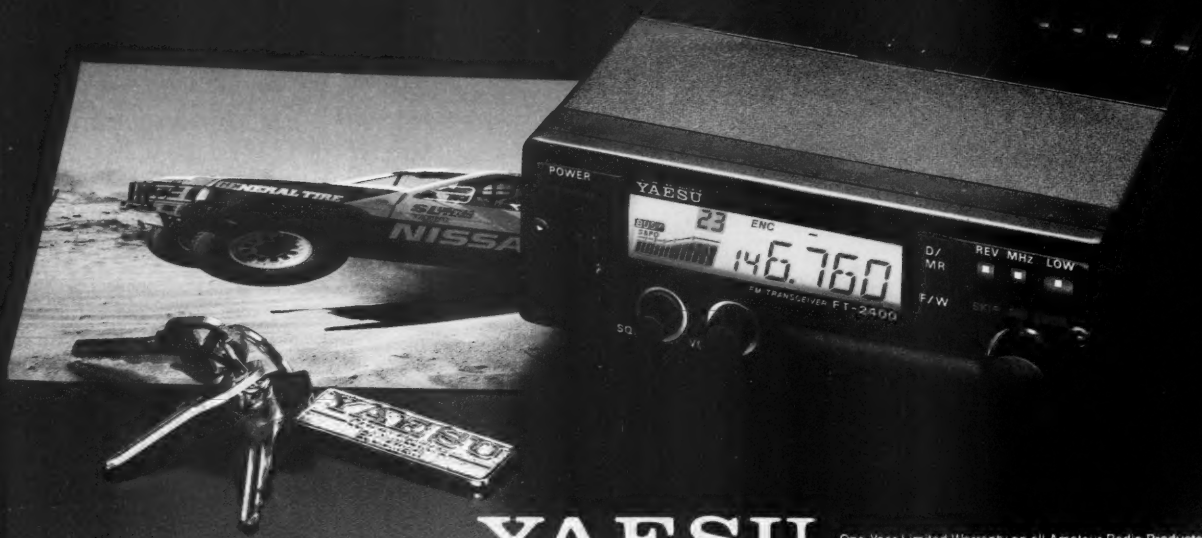

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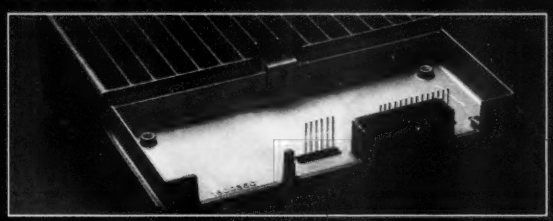

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MY GAP CHALLENGER DX-VI

Lew McCoy, W1ICP
CQ Technical Editor
(March 90 Review)

..."could actually hear signals that were in the noise on the beam. In my comparisons between the base-fed vertical and the GAP, the GAP consistently outperformed the base-fed antenna. Most of my reports were approximately one s-unit better with the GAP. One other surprise was that the GAP vertical was quieter (less noise) than the two base-fed verticals. I would rate the GAP as a quality product, but even more important a good performer."

Richard Morrow, K5CNF
73 Magazine
(October 90 Review)

"another very good thing about the GAP antenna is that you don't have to tune it. Usually broadband antennas are not very efficient, but this one is. If I could have only one antenna, I would definitely rather have this one. The lack of lossy coils, and the coverage of a very wide part of 75 meters by an all band vertical, impressed me more than a little!"

Kurt N. Sterba
Worldradio Magazine
(February 91 Review)

"These guys have solved a problem associated with verticals. That is, an awful lot of RF is wallowing around and dropping into the dirt instead of going outward bound. How does it perform? Like a hot knife through butter. I was just a barefoot boy answering the CQ callers. They just kept coming back to me. POW! POW! POW! I am almost struck with disbelief myself. I mean, this is a vertical. But then, it's a vertical with a big difference. I was indeed pleased. If I were a whole lot younger and I had two of those GAPs phased, I'd tell those contest hotshots to . . . look out!"

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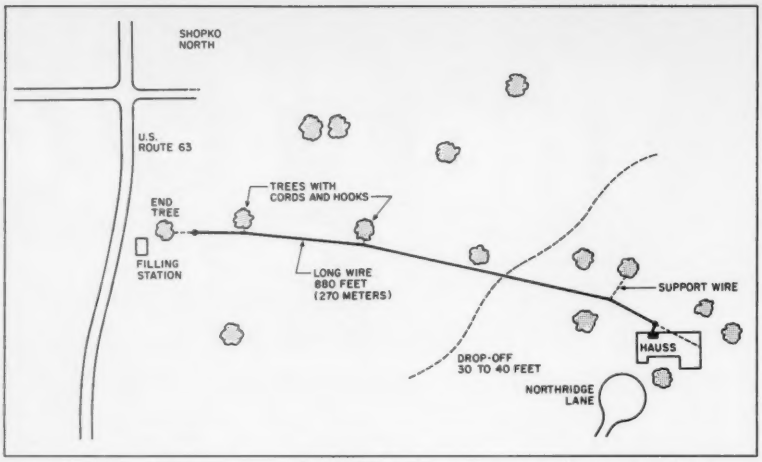

Figure 4. Map of long-wire antenna at W1GV. The wire runs in almost a straight line, an important feature for obtaining the characteristic directional pattern.

whole end insulator redone, and the wire pulled up again. *Lesson: Don't think that a wire won't snap.*

2. The wind blew the arrow off-course. Thus it did not catch the line in the highest part of the tree. *Lesson: Work when there isn't much wind (10 miles per hour or less).*

3. The arrow didn't have enough weight on it. It wouldn't come down where we wanted it to, or it wouldn't come down at all. *Lesson: Put enough weight on the tip of the arrow (a large stove bolt or two) so that the arrow will reach the ground.*

4. The fishing line or twine came off the arrow as it was fired. *Lesson: Secure the line to the arrow, and be sure the line is strong enough to take the initial tensile surge as the arrow is fired.*

5. The arrow was lost or got stuck out of reach. *Lesson: Bring two or three weighted arrows.*

6. The fishing line snagged on a twig with one ounce tensile strength, preventing a heavy, 50 mph arrow from even leaving the vicinity of the firing point. The arrow rebounded and struck the shooter in the face. *Lesson: Avoid snags and wear safety goggles.*

7. The end wire, or rope, snagged in the tree as it was being pulled over. This probable event should be anticipated. *Lesson: Tie a knot that is "streamlined" to reduce the snagging tendency (see Figure 2).*

8. The span was simply too long. At first I had planned to run a 1,000-foot (305-meter) single span of wire. I thought that the light weight of aluminum would make this possible, but the sag and tension were simply too great. *Lesson: Don't go for a single span; provide for intermediate supports.*

After all these lessons, the entire wire, including the lead-in, was finally up, with not a single splice. There were no joints to become corroded. It is very difficult to solder aluminum wire, so this was important.

Intermediate Supports

The wire ran near two large trees, and was snagged on a third one about 20 feet (6 meters) above the ground. The intermediate trees could have been used as supports by shooting weighted arrows over them, then pulling the entire long-wire through, but I was worried about tangling or kinking the wire. However, we figured out how to use these two trees for support, and unsnagged the wire from the third tree.

First, a weighted arrow was shot over the tree, using heavy braided 20-pound test line. Then a No. 4 fishing hook, the triple kind like a miniature grappling hook, was attached to the near end of the line, or the end that also was on the same side of the tree as the wire (Figure 3). The other end of the line was pulled until the hook caught on the wire, which it would *have* to do, having three barbs at 120 degrees apart. The wire was raised gently until the tension was deemed sufficient or the wire was high enough, then the line was secured to the bottom of the tree around a limb about an inch (2.5 centimeters) in diameter.

This technique allows for the wire to slide when the wind blows. It's not the strongest, most durable arrangement, but if it fails, the whole antenna won't come down. When dealing with an 880-foot long-wire, we must expect that eventually part or all of it will have to be restrung.

Finally the wire was connected to the transmatch and the grounding system was installed.

Grounding: DC and RF

Fortunately there was a cold-water pipe, copper with soldered joints, running through the wall right behind the rig. It seemed as though Murphy had slipped. It was difficult to believe this was possible, and my skepticism proved well justified. Oh, the pipe was there, all right, and was grounded for DC, as was evidenced by the shock I got when I made the mistake of touching it at the same time as touching the wire from the chassis of the radio, with the radio plugged in. As I breathed deeply and checked my pulse to make sure my heart was still beating, I recalled the old saying, "Never touch two grounds at the same time."

What smart-alec plumber put the RF choke in the pipeline? The ground did not work well at all for RF. On 40 meters, whenever the key was down, the receiver protection lamp lit up bright white on the back of the FT-101EE, and on 15 meters there was RF all over the house: The intercom picked up monkey chatter on SSB.

Any end-fed wire is bound to present problems of this kind. First, since the radiating part of the antenna comes right down to the station, there will inevitably be at least some "RF in the shack," even with a perfect grounding system. Second, the system is inherently unbalanced, and this makes a good ground mandatory. There are various ways to make the ground good, or at least fair, for RF. All of these techniques involve using resonant wires for each band to be used.

I installed quarter-wave, free-end wires for 10, 20, 40, 80 and 160 meters. The 40 meter wire worked as a 3/4-wave wire at 15 meters. The shorter wires were simply cut to the lengths as measured: about 8 feet for 28 MHz, 16 feet for 20 meters, 32 feet 8 inches for 7 and 21 MHz, 66 feet (20.1 meters) for 3.5 MHz CW, and 130 feet for 1.8 MHz near the bottom of the band.

The 160 meter wire was trimmed by tuning into it and pruning for minimum SWR at 1.810 MHz, the center of the desired operating range of 1.800–1.820 MHz. Surprisingly I had to trim about 7 feet from the wire to get minimum SWR at 1.810 MHz.

The ground wires were strung as straight as possible. This would, it was thought, enhance their performance as RF grounds, by maximizing the efficiency with which they would radiate the RF in the shack away. All these wires were tied together at the station and connected to the ground terminal on my MFJ-989B "Super Tuner V."

There was no evidence of any RF on my HF rig after the ground wires were installed. However, using a linear amplifier, some lighting of the receiver protection lamp was still evident on 160 and 80 meters.

Since I rarely use the amplifier, and in fact was only borrowing it for an upcoming 160 meter contest, I left the antenna perfection phase, and began the real acid test of finding out how well the long-wire would perform. I hoped for the best from a straight wire that measured 13 wavelengths at 20 meters, and 6.5 wavelengths at 40 meters, and was up 50 feet high. The wire was almost perfectly straight except for the lead-in, and I surmised that the major lobes would give a gain of about 9 dB on 20 meters and 5 dB on 40 meters. These determinations were made based on information in *The ARRL Antenna Book* (13th edition, page 165) and the *Radio Handbook* (22nd edition, p. 28.3, Howard W. Sams & Co.).

On The Air

The antenna runs west-northwest by east-southeast, or at azimuth 300 degrees from the house (Figure 4). Major lobes will be expected to run roughly at azimuth 285–315 degrees and 105–135 degrees on 14 MHz, with secondary lobes making these regions broader and closer in off the ends of the wire. On 7 MHz I would expect similar performance, with somewhat broader lobes. I was especially interested in VK6 and the Indonesia chain at 7 MHz, which I would listen for in the mornings.

The loudness of the VE7 stations was the first thing I noticed. One of them was even louder than a friend two miles away on a line of sight at 14 MHz. In fact, this VE7 is to date the loudest signal I have ever received on this radio, *bar none* (even the calibrator). He tipped the meter at S9 plus 37 dB, and while I do not regard most S-meters as absolute, this level qualifies as "S9" by anybody's standards. I worked several VE7 and VE6 stations, as well as loud W7s (who always seemed to be in Washington State), to verify that this antenna could radiate as well as receive in that direction.

Signals were also strong to and from W2 and W3-land, and southern New England, with W1AW code practice often as strong as the locals, both on 14 MHz and on 7 MHz. I rarely could hear any signals from Europe, although Africa was easy to get. The theoretical directional properties of an unterminated long-wire were being confirmed.

I have worked many stations now on 160 through 20 meters with this antenna. While it is a good performer and very inexpensive, all good things must end. The large tract of land on which the antenna resides is scheduled for development soon. More than anything, an antenna like this is a good conversation piece. It *sounds* awesome to say, "Rig HR 90 W output to 880 FT long-wire pointed right at U." The wire is almost invisible, and creates no eyesore. I use a grounding switch outside the window when the antenna is not in use; a long-wire picks up substantial static electricity and induced voltages from utility lines. If it happens to come down, I'll just put it back up again, maybe in a different direction just for fun. It would be possible to put up several different long-wires and switch them for work in various directions, and I probably would do it, too, if the property were going to be available longer—and if I were going to stay longer.

Conclusion

I thank the members of the local radio club who helped me with this project in cold weather. I am also grateful for their interest in the project and their putting up with my seemingly endless chatter about antenna theory on the local 10 meter SSB net.

If there is room for a true long-wire antenna, I'd say it is a good investment of time and money and effort to string one up and get on the air with it—for fun, if for no other reason. 73

You may contact Stan Gibilisco W1GV at 340 Cedar St., St. Paul MN 55101. Please enclose an SASE.

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MFJ 1274 Packet TNC
MFJ 1284 Starter Pack Software

Outbacker HF Mobile Antenna

3rd Prize Winner
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(Ham Radio Toy Store, Wheaton, IL)

Kenwood TS-790A UHF/VHF All-Mode Transceiver
Kenwood PS-31 Power Supply
Kenwood SP-31 External Speaker
Kenwood TSU-5 CTCSS Decoder
Kenwood MC-80 Desk Mike

AEA 144 Isopole Antenna
AEA 440 Isopole Antenna
AEA MM-3 Morse Machine

MFJ 1270B Packet TNC

4th Prize Winner
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(Music City Ham Shack, Madison, TN)

Kenwood TM-941 Tri-Bander

AEA PK-88 Packet TNC
AEA 144 Isopole
AEA 440 Isopole

MFJ 264 Dry Dummy Load

5th Prize Winner
Raymond Anderson WB7ASZ
(Amateur Radio Supply, Seattle, WA)
Kenwood TM-631A 2 meter/220 MHz Transceiver
AEA PK-88 Packet TNC
AEA 144 Isopole
AEA 220 Isopole
MFJ 921 VHF Antenna Tuner/Wattmeter

6th Prize Winner
Hugh Boycott VE3HHB
(Atlantic Ham Radio, Ontario, Canada)
Kenwood TM-731A 2 Meter/440 MHz Transceiver
AEA PK-88 Packet TNC
AEA 144 Isopole
AEA 440 Isopole
MFJ 1724 Tri-Band Mobile Antenna

7th Prize Winner
Ron Suave NX0H
(Gateway Electronics, Denver, CO)
Kenwood TH-75A 2 Meter/440 MHz HT
Kenwood DC-1 DC Adapter
Kenwood BC-11 Rapid Charger
Kenwood SMC-31 Speaker Mike
Kenwood SC-22 Soft Case
AEA PK-88 Packet TNC
AEA 144 Isopole
AEA 440 Isopole
MFJ 840 HT Wattmeter
MFJ 24 HT Holder
MFJ 1712 Dual Band "Pocket Linear" Antenna
MFJ 280 Mobile Speaker

8th Prize Winner
Eric Ferguson KA6USJ
(The Base Station, Concord, CA)
Kenwood TM-701A 2 Meter/440 MHz Transceiver
AEA PK-88 Packet TNC
AEA 144 Isopole
AEA 440 Isopole
MFJ 817 144/440 Cross-Needle Wattmeter

9th Prize Winner
Steve Jackson KB4DYM
(C.T. Morgan & Assoc., Chattanooga, TN)

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Kenwood SMC-30 Speaker Mike
Kenwood SC-27 Soft Case

AEA PK-88 Packet TNC
AEA 144 Isopole

MFJ 840 HT Wattmeter
MFJ 1714 "Pocket Linear" Antenna
MFJ 24 HT Holder
MFJ 280 Mobile Speaker

10th Prize Winner
Jack Todd WB5AUR
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AEA PK-88 Packet TNC
AEA 144 Isopole

MFJ 812B SWR/Wattmeter

11th Prize Winner
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Kenwood SMC-32 Speaker Mike

AEA PK-88 Packet TNC
AEA 144 Isopole

MFJ 840 HT Wattmeter
MFJ 1710 "Pocket Linear" Antenna
MFJ 24 HT Holder
MFJ 280 Mobile Speaker

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AEA 430-16 16 Element, 430MHz Beam

Monthly Winners
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108B Dual Time Clock
1281 Easy DX Software
1286 Gray Line DX Software
Golden Classics of Yesterday by Dave Ingram K4TWJ
Packet Radio Made Easy by Buck Rogers K4ABT
The Wonderful World of Ham Radio by Richard Skolnik KB4LCS

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Bill R. McGill
(HSC Electronics, Santa Clara, CA)

MFJ Prize Package
948 Deluxe 300W Antenna Tuner
960B Dry Dummy Load
108B Dual Time Clock
1281 Easy DX Software
1286 Gray Line DX Software
Golden Classics of Yesterday by Dave Ingram K4TWJ
Packet Radio Made Easy by Buck Rogers K4ABT
The Wonderful World of Ham Radio by Richard Skolnik KB4LCS

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Bob Adams W8BHF
(Michigan Radio, E. Detroit, MI)

MFJ Prize Package
422B Keyer/Paddle
816 HF SWR/Wattmeter
108B Dual Time Clock
1281 Easy DX Software
1286 Gray Line DX Software
Golden Classics of Yesterday by Dave Ingram K4TWJ
Packet Radio Made Easy by Buck Rogers K4ABT
The Wonderful World of Ham Radio by Richard Skolnik KB4LCS

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Jerry J. Mikuta N6VG
(The Radio Place, Sacramento, CA)

MFJ Prize Package
204B Antenna Bridge
1701 6-Position Antenna Switch
108B Dual Time Clock
1281 Easy DX Software
1286 Gray Line DX Software
Golden Classics of Yesterday by Dave Ingram K4TWJ
Packet Radio Made Easy by Buck Rogers K4ABT
The Wonderful World of Ham Radio by Richard Skolnik KB4LCS

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Dick Ouellette N6RTY
(Rivendell, Derry, NH)

MFJ Prize Package
Ameritron RCS-8V Remote Coax Switch
1701 6-Position Antenna Switch
108B Dual Time Clock
1281 Easy DX Software
1286 Gray Line DX Software
Golden Classics of Yesterday by Dave Ingram K4TWJ
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Websersat Success

The microsat with the photographic penthouse, Weber-OSCAR-18, has been featured before in this column. Now it's time for an update. Recent pictures from the satellite of the earth, sun and moon are showing a definition and quality the designers only hoped for years ago.

Launched in January 1990 with three other microsats and two UoSATs from England, Websersat, as it's called at Weber State University in Ogden, Utah, is the second project undertaken by the Center for Aerospace Technology (CAST) at Weber State. The first was NUSAT 1 (Northern Utah Satellite 1), launched by the *Space Shuttle Challenger* in 1985. CAST continued with ambitious programs and teamed up with AMSAT to work on the microsats.

Websersat weighs 27 pounds. Its dimensions are 9" x 9" x 12.5". The unusual 12.5-inch height on one side is due to the camera and student-created experiments encased in the upper unit. Most of the satellite is covered with solar panels. Within the satellite are six vertically stacked sections that communicate through a Local Area Network (LAN) bus. The lower five sections contain two 70 cm transmitters, a five-channel 2 meter receiver, the battery system and charge regulator, and a flight computer and digitizer system with logic support circuitry.

The uppermost module carries the color camera, a spectrometer, an L-band TV receiver, an impact sensor, a horizon detector, a command and control unit, a magnetometer, an FM modulator for low speed video transmission or synthesized voice with beacon messages, and an array of sensors for temperature, voltage, current and light intensity measurements.

While the scientific experiments on Websersat have been extremely useful for educational studies by schools around the world, the imaging and download system have been the highlight for amateur radio operators. The satellite takes pictures of the earth, or another celestial view, and transmits the image via phase-shift keyed AX.25 packets.

The camera is a modified Canon CI-10 CCD (charge-coupled device) unit with a 25mm lens using either programmable or automatic iris. When aimed at the earth, the camera sees an area 130 by 170 miles. The digitizer processes the video from the camera, then sends the image data to memory for downloading via the packet transmission system. Up to 12 pictures can be stored in the two-megabyte memory. Each image can be as large as 166,000 pixels (individual picture elements or dots on the screen). While the data can be downloaded to the earth via the FM modulator, it is usually sent by the packet radio system.

Hardware and Software

To receive the images, a station must have a PSK demodulator hooked to a Terminal Node Controller (TNC) and a computer capable of receiving the data and storing it. For those already on packet, the move requires a PSK modem and a 70 cm sideband receiver with input lines (microphone up/down buttons) allowing digital frequency control. Modems are available from PacComm, the Tucson Amateur Packet Radio Corporation (TAPR), Radiokit, L.L. Grace, and Advanced Electronic Applications (AEA).

Although directional antennas will help collect more picture data on each pass, they are not absolutely necessary if a good GaAsFET preamp is available with an omnidirectional home-station antenna. Antennas currently in use for local FM operation should be tried before purchasing or building a larger or more complex system. The primary downlink frequency is 437.102 MHz and the secondary is 437.075 MHz.

A PC compatible computer with EGA or VGA graphics, along with appropriate software, is required to collect the picture data. First, put the terminal node controller (TNC) in the KISS mode with the command KISS ON followed by RESTART. Use a data collection program like TLMDC version 3 (available as free software on many BBSs) and follow the instructions included with the program. Normal data and messages will be displayed on the screen during a pass while the raw picture data is stored in a file.

WEBERWARE 1.1 from Weber State University, available from AMSAT for $30.00, decodes the raw picture files and merges data. It takes at least two passes to get a complete picture, since even picture lines are sent on the first orbit, and odd lines are sent on the next. Work has begun on a new version of WEBERWARE, but it may be as long as a year before it becomes available.

Other individuals have produced ex

Photo A. QSL card (opened, front and back) from Weber State University for reception of telemetry from Weber-OSCAR-18.

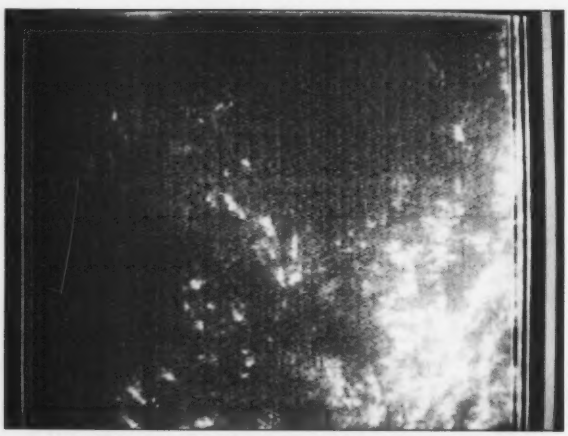

Photo B. Wispy cloud formations seen by W-O-18 on August 18, 1990.

Photo C. View over Sumatra taken on April 14, 1991 by W-O-18 at 0433 UTC.

perimental software to provide the maximum resolution available from the Webersat imaging system. The photos show super-VGA images created using a very early version of WEB1 by Franklin Antonio, author of the very popular Instant Track satellite tracking software. The program only works with high-resolution systems and currently requires picture data previously merged and filled in by Weberware to get finished pictures. Plans are underway to begin beta testing of WEB1 sometime before the end of the year.

Before Webersat was launched, many pictures were taken, stored, and transmitted from the satellite. These pictures were of buildings and scenes around the Weber State campus. When viewed with either WEBERWARE or WEB1, the pictures show very good detail and contrast. Many of the early shots from space did not. They appeared grainy with bad exposure and contrast. Many hams lost interest in the picture packets from space.

Attaining New Heights

On August 15, 1990 the controllers at Weber State successfully took a picture of the sun. (A WEBERWARE version of the image was presented in the December 1990 "Hamsats" column.) Within a month, better earth views were also being taken.

In March, the controllers began shooting pictures in the dark, and caught the moon. The camera specifications did not indicate that this would work, but it did. Although it is difficult to see, the moon appeared as a crescent in the upper right-hand corner of the photo (not shown) that I was able to take from the monitor screen.

The earth view of April 14, shown in Photo C, is an example of some of the earth views currently downloading from Webersat. The resolution looks more like a commercial weather satellite, rather than a $10,000 amateur device built by students.

Unlike commercial satellites, views of other parts of the sky are possible with W-O-18, and experiments to try new ideas with the imaging equipment are encouraged. Weber State began testing systems in June for possible imaging experiments in July during the solar eclipse. All the onboard memory was used to collect image data in hopes of catching views of the sun and earth during the eclipse.

More experiments are expected from the team at Weber State, and further software developments are hoped for. More information on W-O-18 is available in a recently released manual created by CAST and sold through AMSAT. Although the manual doesn't have the data necessary to write picture processing programs, it does provide plenty of general data on the satellite and its many experiments and capabilities. Call AMSAT at (301) 589-6062, or write P.O. Box 27, Washington, DC 20044 for more details. 73

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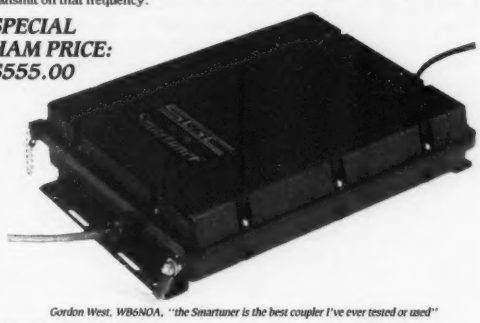

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FT-736R	2M/70CM 220/1.2 SAT	1822.00	CALL
FT-5200	2M/70CM DUAL BAND	749.00	CALL
FT-8200	70CM/1.2 DUAL BAND	899.00	CALL
FT-2400H	2M 50W,LCD,CTCSS	419.00	CALL

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Parts!

Selecting them, finding them, buying them, substituting them, even recognizing them—parts are where it's at! Equipment is, after all, just a collection of components, all wired together to achieve an end. Sometimes, however, parts can be a big pain in the dummy load, because they may be hard to find, or their markings may be cryptic or nonexistent. Let's take a look at managing parts problems.

Although some repair jobs can be accomplished without new parts, many cannot. If you have or can easily get what you need, great. But real life seldom works like that, especially in electronics. When you need a new component and can't get it, the first thing to consider is the original part's function. Was it part of a critical circuit like a balanced mixer? Or was it a simple DC AGC amp, or perhaps a switching circuit? Once you know what is called for, you can make some intelligent decisions regarding a reasonable substitute. The process varies according to the type of part required, so let's look at a few:

Resistors, Resistors

If the original resistor was a standard 5 percent type, the circuit probably was not too critical, and any standard resistor of the same value (or nearly so, if you must wire multiple resistors together to get one close), and the same or greater wattage rating, should work. Of course, be sure to fix whatever malfunction was pulling too much current through the old resistor before inserting the new one, or you'll just fry that one, too. Resistors do not burn up on their own—something else takes them out.

Never use a wire-wound power resistor when the old one was a composition type. Wire-wounds are basically coils, and they do have significant inductance. Even in DC power supplies (especially switching supplies or switching regulators), they can wreak havoc. Of course, if the original part was wire-wound, then it's OK to use the same type. Usually, you can substitute a composition resistor for a wire-wound (as long as the new part can handle the power dissipation), but there are odd exceptions in which the designer used the inductance of the wire-wound resistor, or at least compensated for it elsewhere. If you're not sure, just replace the resistor with the same type and all should be fine.

If the original resistor was a high precision type, you must replace it with another high precision resistor. Those things cost extra (although not a great deal), so manufacturers use them only when necessary. You can be sure that circuit performance will be significantly affected by an out-of-tolerance part. For that matter, some circuits may require realignment even if you use the correct part.

Note that even if you find a standard 5 percent unit that measures within the tolerance of the high precision part, don't use it. The drift and thermal characteristics are looser on the standard part, and it may drift out of tolerance over time. Precision resistors are available at many mail-order outfits, and they don't cost a lot anyway.

Can You Read Me?

How can you tell if a resistor is high precision or not? If it has four color bands and the last one is gold or silver, then it is a standard 5 percent part. If it has five color bands, then it is a 1 percent part. On these, the value is represented in the same way as for standard parts, except that one more digit is specified. For example, a 1k ohm 5 percent resistor reads brown, black, red, gold. That's 1, 0, 00 and gold for the tolerance. A 1k ohm 1-percent part would read brown, black, black, brown, brown. That's 1, 0, 0, one zero and brown for the tolerance. It sounds hard but, once you get used to it, it's not much different from reading standard parts.

By the way, the standard resistor tolerance back in the tube days was 20 percent! Those resistors had no tolerance marking, so they only had three color bands. Then came 10-percent parts, which had a silver band. In modern gear, though, I doubt you'll see anything looser than the gold-banded, 5 percent units. Naturally, it's fine to replace a looser-tolerance part with a better one.

Let's Cap It

Capacitor substitution is much more complicated. Caps come in many forms, and each one has its own characteristics. As with resistors, first determine the function of the original part. If it was a simple bypass cap, darn near anything will work fine as long as the value is in the ballpark and the voltage rating is as high or higher than the original's. Same goes for coupling caps between audio stages. If, however, the cap was in a tuned circuit, you had better use the right part or a better one.

Caps come in many flavors. There are ceramic, polyester, polystyrene, polyethylene, mica, metalized film, metalized polyester, tantalum, aluminum, paper, and a few more which slip my mind at the moment. And within each group, there are subgroups. Ceramics, for instance, may be NPØ, which means "negative/positive zero." This refers to the drift with temperature, and specifies that the cap will neither increase nor decrease its capacitance value as it warms or cools. NPØs are most commonly found in tuned circuits, as they are overkill in bypass and coupling applications.

If a similar-looking ceramic cap says "Z5U," "N750," or some other number in addition to its value, don't use it to replace an NPØ; drift will result. In most cases, it is safe to replace a lesser-quality cap with an NPØ, but even this is not always true. I have seen occasions where a cap with a specific thermal drift characteristic was used to compensate for other parts' drift in the opposite direction! To be safe, in a tuned circuit always use the same type cap as the original.

Plastic caps of the "poly" variety are very stable, and their true values fall quite close to their stated ones. It can be hard to tell which variety you're looking at, because most of them look the same—like a small, rectangular green case with two leads sticking out the bottom. Generally, the size is a giveaway; if you can get the same value in the same size, it is probably the same type! Luckily, most circuits are not critical enough to care which kind you use, but there are exceptions. If in doubt, try it—you won't blow anything up. The worst that might happen is some drift or substandard performance, which you can remedy with another cap.

Tantalum caps are quite common these days because they offer lots of capacitance in a very small package. They're used in power supply, audio and coupling applications. In my experience, they are quite prone to shorting out. If you find a bad one, be sure to replace it with another tantalum part. Because of the high capacitance values, your only other choice would be an aluminum electrolytic, and those have much looser specs than tantalums.

Like normal aluminum caps, tantalums are marked with + and - and are polarity sensitive; be sure to put the new one in the right way around! If you install one backwards and apply power, discard it and use another, even if it still seems to work. Tantalums just won't stand reverse polarity, even for a second, and that reversed cap will fail in short order.

Aluminum electrolytics are those largish cans you always find near power supplies and in audio stages. They are pretty failure-prone, but they are easy to get. Normally, they are polarity sensitive and, like tantalums, are marked with + and -. There's an exception, though. Non-polarized aluminum caps are used in AC applications like hi-fi speaker crossover networks, and they cannot be replaced with normal electrolytics because the alternating polarity will destroy a polarized part.

Non-polar caps are usually marked "NP," and they never have + and - on them. They're a bit harder to find but, should you need one, you usually have no choice because no other type of cap has high enough capacitance without being polarized. If the NP cap is of fairly small value, you may be able to get away with using other non-polar types. For instance, I recently replaced a 3.9 µF non-polar cap in the horizontal sweep section of a computer monitor with four 1 µF polyester caps wired in parallel. The voltage rating of the new caps was high enough, so I tried it and it worked fine.

Speaking of voltage ratings, always remember that you must *never* replace an electrolytic cap of any kind with one that has a lower voltage rating. Manufacturers typically use parts with ratings 50 to 100 percent higher than the intended applied voltage. Use of a lower-rated component is likely to result in premature failure, and use of one with a rating lower than the actual applied voltage will quickly result in smoke!

It Gets Crazier

Substituting semiconductors gets really wild, because there are so many kinds. Diodes, transistors, FETs, MOSFETs, linear ICs, digital ICs, TTL, LSTTL, CMOS . . . there's just no end to the variety of what you might find in today's rigs.

In years gone by, manufacturers were forced to make their gear from "off the shelf" parts, which made it easy to find replacements. The increasing complexity of today's rigs, combined with the Japanese financial structure's willingness to commit to special purpose parts (a key element of that country's tremendous success), has created a trend of custom components.

You just can't build a camcorder or a 3 x 5-inch computer-controlled walkie from off-the-shelf components! Especially in the digital sections, manufacturer- and even model-specific chips are the rule.

Chipping Away at It

Luckily, those custom ICs rarely go bad. I have seen blown microprocessors (lightning cases) only a few times in my entire electronics career. If you do have a bad custom chip, you must go to the manufacturer for a new one. Even in the case where, say, a Matsushita or NEC microprocessor was used in another maker's product, that seemingly "standard" part probably has a suffix on its part number, which indicates that it has some specific ROM code built into it. Another "identical" part, but with a different suffix, won't work.

Sometimes, chips which may at first glance appear to be custom really aren't. Many standard ICs, with standard part numbers, are disguised by extra numbers and letters tacked onto the "standard" designator. The extra characters are used to identify the specific maker, case style, temperature range, etc. For instance, a D4011BC, a CD4011BCN and an MN4011B are all the same part, in this case a 4011 CMOS quad NAND gate worth about 25 cents. But if you order that part from the rig's manufacturer, you'll probably pay 10 to 100 times its true value and wait quite a while to get it!

The only way to recognize the standard designators hidden in part numbers is to become familiar with the generic numbers used for different families of ICs. For instance, standard "low-speed" CMOS parts use the 4XXX code, while low-power Schottky TTL is specified by 74LSXXX.

We'll continue this next month, and wrap it up with the names and addresses of as many of the major parts sources as I can find. See you then! 73

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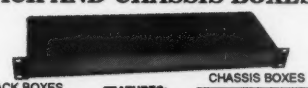

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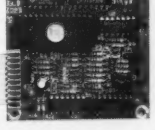

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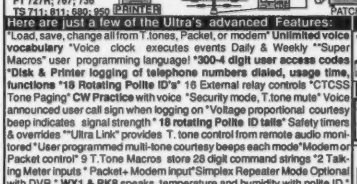

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DARA Balloon

When launching ATV balloon experiments, the careful choice of a launchsite has a direct bearing on your success. The Dayton Amateur Radio Association (DARA) found the ideal location to fly their ATV balloon experiment: an actual weather bureau radiosonde installation just northeast of Dayton!

Permission was granted to use the facility after the morning radiosonde launch. Two radiosonde balloon flights are made each day (7 a.m. and 7 p.m. EDT) from the Huber Heights location (see Figure 3 on p. 31 of the August '90 issue of *73* for a map of U.S. radiosonde sites). The radiosonde transmits a series of telemetry tones on 1680 MHz which are decoded at the ground station computer (altitude, temperature and humidity). An 8-foot dish in a radome on top of the inflation building (see Photo A) tracks the balloon during its flight to indicate azimuth and elevation to within 0.01 degree accuracy. The ground computer uses this data to calculate wind direction and velocity at various altitudes which are used for pilot winds aloft forecasts. Those of you with a receiver that tunes this frequency in wide-band FM mode can listen in to these signals (the ICOM R-7000 and the ACE AOR-3000 has been used successfully).

Liftoff

Tom White, who works at the facility, launched the radiosonde at 7 a.m. as the DARA group was setting up for their flight. Tom's advice and help during the DARA flight was invaluable (he's launched well over a thousand weather balloons in his career!).

As the radiosonde was parachuting back down, the DARA group assembled their ground station and started filling up their balloon. Usually just the significant levels of radiosonde wind data are available at the FAA. Since we were at the actual site, all of the data was available so we could crunch it through the BALLTRAK tracking program. As a result, the computer prediction came within 300 yards of the actual touchdown!

Everything was on schedule for an on-time liftoff. The balloon was nearly inflated and the payload was ready. It looked like a picture perfect liftoff was in the making. As Dave Pelaez AH2AR/8 was inflating the balloon, he paused to smile for the cameras. His smile quickly changed to a frown, when a large POP was heard! The balloon had burst due to a flaw and flopped down on the table in a useless pile of rubber.

Fortunately, another balloon materialized and there was just enough helium (with a hydrogen assist) to fill another one. Although this balloon looked very distorted with a clear bubble on top, it survived liftoff and flew to over 86,000 feet.

Photo A. The DARA group inflates their first balloon in front of the radiosonde launch facility in Huber Heights, Ohio.

The Payload

The video section of the payload consisted of a Uniden VM-100 TV camera, a P.C. Electronics KPA5-RC 1 watt transmitter and a High-Technology Flight telemetry computer board with video overlay display (on-screen display of the W8BI callsign, temperature and altitude). A Hamtronics TA-51 two meter FM transmitter (modified for 100 mW output) sent out a digitized voice message on 144.34 MHz (Rainbow Products voice digitizer). In addition, a 1-watt CW transmitter (Ramsey QRP-20 with a GLB-2 CW ID) on 20 meters (14.035 MHz) sent out a message to the world. Since the Indianapolis Foxhunters were chasing down this package, I decided the recovery chances were good, so I risked my 35mm film camera which we piggy-backed on the side of the payload (it has now survived three trips to the edge of space!).

Photo B. The W8BI balloon ready for liftoff.

The Flight

Great views of the suburbs of Dayton were seen via the downlinked video for the first few minutes. Since it was a hazy and fairly cloudy day, very little could be seen except for the telemetry overlay after the balloon passed through several cloud layers. Occasional views of the horizon were seen near the top of the flight.

Snow-free video was seen out to over 200 miles away. The 2 meter and ATV signals covered a good deal of the Midwest (a 400-mile plus range) at peak altitude (from Niagara Falls, Ontario to Iowa).

Touchdown

The upper level winds were very light. The weather bureau radiosonde travelled just 11 miles and landed very near the skycrapers in downtown Dayton. This had us a little worried (nothing like recovering a payload dangling from the top of a 50-story building!). Fortunately, the DARA balloon didn't go up as high as the radiosonde and parachuted down just east of the city in the open countryside. The Indianapolis foxhunt team kept under the balloon throughout its journey. Veteran balloon hunter Larry Oaks WB9YAJ told us his secret; "I just charge directly at the balloon at all times during its flight." This technique apparently paid off. Spectacular views of the highway and the suburb of Kettering were received by the chase team as the payload descended through the cloud layer at 1000 feet. The foxhunters closed in on their prey. Tom N9DZJ called in that he was very close to the payload but couldn't see it (it was 200 feet directly ABOVE his van). Larry WB9YAJ was about 200 feet behind Tom and actually saw the package parachuting down. If there hadn't been another car in the way in front of him, he

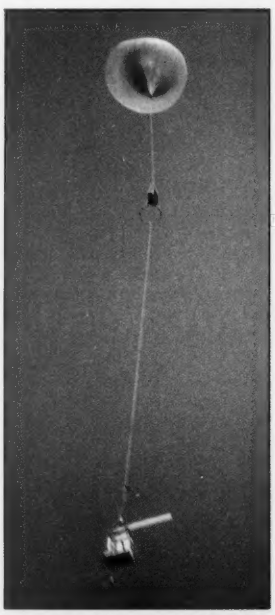

Photo C. A picture perfect takeoff. The balsa wood fin really helped prevent the payload from spinning.

could've jumped out of his car and caught it before it hit!

Paul W9DUU and Chuck WB9IHS were in the car just behind Larry. They had an ATV downconverter and VCR in the car and videotaped the actual payload footage of the landing. It was great watching the final moments as the package narrowly missed a warehouse roof, bounced off of a tree limb and landed in a yard just 10 feet from the road. The package landed with the TV camera pointing up at the treetops. Shortly after landing, it showed the smiling faces of the chase team waving into the lens!

Although the 35mm film camera froze up after 60,000 feet, some great shots of the clouds were taken up to that point.

The DARA group had such a great time with this first flight that they plan another flight at 9 a.m. on the morning of October 6. For more information, check into the launch information net on 7.258 MHz (MIDCARS) just prior to liftoff. 73

Photo D. The Dayton Amateur Radio Association launch and recovery team.

Photo E. Landing site (10 miles southeast of the launch point). The recovery crew (l to r): Jeff KA8WLV, a neighborhood resident, Chuck WB9IHS, Paul W9DUU and Tom N9DZJ (Larry WB9YAJ not in picture).

Photo F. Photo from 60,000 feet (taken from the onboard 35mm film camera).

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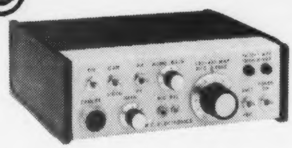

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- #22 PTP — XPACKET, XMODEM, Ascii, binary. TNC1&2, PK232, KAM, MFJ, AMTOR, RTTY, FAX. Split screen
- #29 BSQ&R95 UUCODE — Compress files for sending over PBBS's and over normal TNC's
- #30 PACKCOM — Easy packet program. Split screens. Color
- #28 DED — WA8DED firmware for TNC1/2 and PK87. Also includes packet terminals

AMIGA

- #47 TCP/IP — TCP/IP for the AMIGA
- #48 HAMPAC — Collection of ham programs for the AMIGA. CW practice, logging, etc
- #49 W0RLI — PBBS for AMIGA. Extras

MORE PROGRAMS FOR THE AMIGA IN OUR CATALOG

C-64

- #45 DIGICOM — Run packet on your C-64 with "NO" TNC!! Supports file transfers
- #46 BBS64 — RAM based packet BBS for your C-64. Written in basic
- #10 C64, M100 — PBBS programs for both C-64 and Tandy Model 100/102. MS-DOS disk

MORE PROGRAMS FOR THE C-64 IN OUR CATALOG

ELECTRONICS

- #31 RF/ELEC — RF and electronic design E R P calculations
- #32/33/34 PSPICE — Electronic simulation. Up to 10 transistors in this student version
- #37 SEMIDATA — Database of Motorola semiconductor line
- #53 CHIPS — Database of selected IC's
- #55 DROEGE — Circuit Board CAD CGA
- #56 RFTOOLS — Calculate noise figures, attenuation, inductance/cap/reactance/VSWR
- #60 FILTERS — Audio filter design. Lowpass, bandpass, highpass. CGA/EGA impressive
- #67 Intermod — Calculate intermod; Tubes — Cross reference for tubes

IBM MISCELLANEOUS

- #38 HAM 1 — Morse code, rtty, satellites, calculations, sstv and antennas
- #39 HAM 2 — Coils, USAT, intermod, great circle distances, network analysis
- #40 HAM 3 — RTTY, BEAMs, resistor codes
- #41 MININEC — Mini numerical electromagnetics; RFSAFE — RF safety calculations; KEN-440 — Computer control your TS-440
- #42 FIELDA — Field day logger
- #43 PC-HAM — Collection of programs. MUF calc, logbook and contesting
- #44 USAT — Oscar locator; GEOSAT — TV satellite locator
- #51 SATRA — Satellite tracking for MS Windows
- #57 MILAIR — Over 382K of Military aircraft frequencies. Zipped
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HF RTTY

The theme of this issue of *73* is HF antennas. HF antennas suggest HF RTTY. That is quite a different animal than VHF RTTY in several ways, so we'll spend some time exploring the facets peculiar to HF RTTY operation.

To begin with, just where do you find a RTTY station on HF? I spent some time tuning around the ham bands, to see just where the activity was on a typical summer's eve. Here in Baltimore, the traditional "hot spots" of 3620 kHz and 14.080 MHz remain one's best bet to find a RTTY QSO. The lead, at least during the early summer, goes to 20 meters, where one session's monitoring picked up stations from all over the United States, several in Europe, and Israel.

Less channelized than VHF, RTTY operation on the HF bands tends to be a bit more hit-or-miss, usually with CQs and RYs being heard. One great advantage to setting up for HF RTTY is the W1AW RTTY bulletin. Currently being sent daily at 0100Z, 0400Z, and 2200Z; and Monday through Friday at 1500Z; RTTY bulletins are sent on 3.625 MHz, 7.095 MHz, 14.095 MHz, 18.1025 MHz, 21.095 MHz, and 28.095 MHz. The transmissions are in 45.45 baud Baudot, 110 baud ASCII, and 100 baud AMTOR in FEC mode. For the amateur setting up an HF RTTY station, these automated bulletins, sent on time, on frequency, and with a strong signal, often provide just the tool to line up the receiver or converter. The information they provide, frequently the latest FCC ruling or information, is not a bad side benefit, either!

Transmitting RTTY on HF may take several paths, as well. A basic CW transmitter may be frequency-shift keyed with a diode and capacitor placed across the frequency-determining element. This "shift-pot" technique was in widespread use before the advent of frequency-synthesized transmitters. Suitable circuits have been printed in "RTTY Loop" before, and I will be happy to run some of them again, if there's enough interest.

Several transmitters provide an internal RTTY mode, and there's also an external adapter specifically designed for RTTY. If such a device is in your hands, going digital is simply a matter of flipping a switch!

The bulk of "modern" amateurs, however, are injecting a frequency-shifted audio signal into the audio input of their SSB transmitter to obtain FSK. This is fine, as long as the injected waveforms are pure, clean sine waves, and the transmitter has an adequately suppressed carrier and unwanted sideband. More and more, modern transmitters accomplish this task with aplomb.

The simple terminal unit demodulators, often used on AFSK circuits on VHF, are frequently unable to handle the rigors of HF communication. Signals below 30 MHz are plagued by static crashes, fades, and interference rarely heard on an AFSK signal. The TUs, therefore, need to be a cut above the simple one-chip wonder. While plenty of older designs, such as the venerable W2PAT terminal unit, are extant, the striking advances in technology over the last several years would suggest that, if at all possible, you investigate obtaining one of the integrated, multimode controllers. Units by AEA, Kantronics, and others provide incredible versatility, with an ease of operation only dreamed about years ago.

Having covered where to operate, the transmitter, and the demodulator, for all intents and purposes, any receiver good enough for SSB is good enough for RTTY. Now we are left with the display device. Here you have three choices: a mechanical teleprinter, a dedicated RTTY terminal, or a general purpose computer.

Let me say it here: Mechanical teleprinters are wondrous marvels that absolutely mesmerize me when chugging away with their covers removed. They are also noisy, messy, heavy, and require more attention than many children. If you have one and can keep it going, more power to you. My Model 15 and Model 14 tape equipment were relegated to the storeroom, along with the ASR-33, as soon as a quiet computer printer showed up. I don't have the heart to throw them away, and somehow I always feel I will get them running again.

Dedicated RTTY terminals had their heyday about 10 years ago. You don't hear much about them anymore, with general purpose computers gaining so much ground. If you have one, as with a mechanical teleprinter, use it! But, as with the former beasty, I could not see going out today and buying one.

That leaves us with computers as intelligent display devices. I've seen them all, and you can't beat 'em! I can sit, typing this article in my word processor program, and hit a few keys and switch into the terminal program for my demodulator. Using Windows on a PC, or on a Mac (I presume), you could even monitor the traffic in one window, while attending to some other task in another. Ah, the wonders of the modern age!

The one thing you won't get from me is a specific recommendation for which computer to buy. There are clear advantages to the inexpensive route, as discussed last month, and there are those who will only be happy with a multimegaflop wonder. Unless you are devoting the computer to RTTY operation, and RTTY operation only, choose the computer with an eye toward what else it can do for you, not how well it can send data over an RS-232 line. That task is no great feat.

Oh, yes, before I forget—HF antennas. You need one! Go ahead and put up one that will work, one that looks good, one that the wife will tolerate. I could tell you a story about the 80 meter vertical I put up, and how I sold the wife on that one, but I'd have to change too many names to protect the guilty. You get the idea.

I've been enjoying the responses many of you have been offering to the question of what frequency RTTY signals are really on in the HF spectrum. Early returns indicate that there is no consensus as to how to specify a RTTY frequency. That and more are topics for future "RTTY Loop" columns. In the meantime, let me hear from you by mail, at the above address, on CompuServe (ppn 75036,2501), or on Delphi (username MARCWA3AJR). 73

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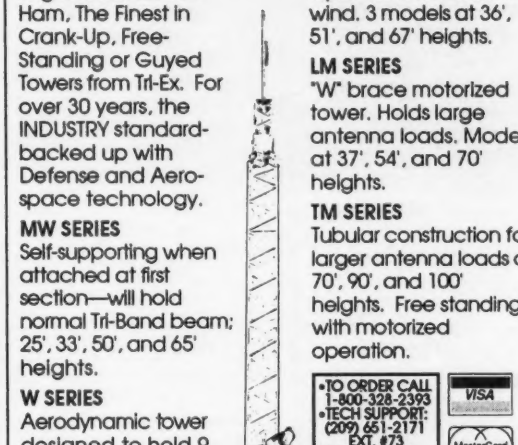

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The suggested retail price for the TS-450S with the tuner is $1,550; without the tuner, $1,350; for the TS-690S, $1,550. *Kenwood U.S.A. Corporation, 2201 E. Dominguez Street, Long Beach CA 90810. Tel. (213) 639–4200; FAX (213) 604–4487.*

ICOM

ICOM has released the three-pound, 5.5″W x 1.6″H x 6.9″D IC-2410A/H 144 and 440 MHz dual-band transceiver. Its features include simultaneous receive on the same band, two versions of output power, crossband repeat, and 36 memory channels. It is microphone controllable.

Price unannounced at present; for more information, contact *ICOM America, Inc., Corporate Hadquarters, 2380 116th Ave., N.E., P.O. Box C-90029, Bellevue WA 98009-9029. Tel. (206) 454–7619; FAX (206) 454–1509.* Or circle Reader Service No. 201.

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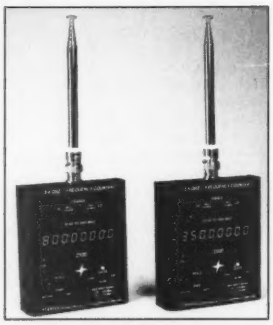
Price for HamBase on 17 1.2M 5¼″ disks, $70; 14 3½″ disks, $80; and 25 800K Macintosh diskettes, $80. For more information, contact *J•Com, P.O. Box 194, Ben Lomond CA 95005. Tel. (408) 335–9120; FAX (408) 335–9121.* Or circle Reader Service No. 221.



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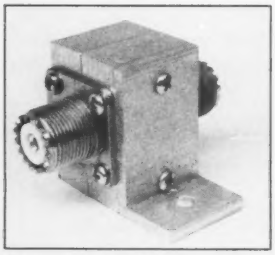
The nine-ounce, pocket-size frequency counter model 3500 from Startek International, Inc., is the smallest instrument of its type that can measure frequencies from 10 Hz to 3.5 GHz. It has an eight-digit red LED display, a display-hold function, a one-meg-ohm input impedance from 10 Hz to 12 MHz, and a 50 ohm input impedance from 10 MHz to 3.5 GHz. The user can select from three gate times, giving a maximum resolution of 0.1 Hz to 12 MHz, and 10 Hz resolution to 3.5 GHz. Internal NiCd batteries provide 3–5 hours of portable operation. 110 VAC adapter/charger supplied. 12–9 VDC auto adapter optional.

Suggested price, $250. *Startek International, Inc., 398 NE 38th St., Ft. Lauderdale FL 33334. Tel. (305) 561–2211; FAX (305) 561–9133.* Or circle Reader Service No. 203.

SOLARCON

Solarcon Corp. of Holland, Ohio, manufacturer of the complete line of Antron antennas, as well as other antennas for amateur radio, CB, and the cellular and scanner markets, announces that June 1, 1991, it retired the Antron name, which was created solely to market the A-99 base station antenna. From now on, Antron antennas and all of their other products will be marketed under their original company name, Solarcon.

The company is still located at the same address. For more information, contact *Solarcon, P.O. Box 176, Holland OH 43528. Tel. (419) 865–5877; FAX (419) 865–9449.* Or circle Reader Service number 202.



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PolyPhaser Corporation has developed a new multi-strike Flange Mount Coaxial Lightning protector which blocks DC, thus preventing harmful surge energy from reaching your equipment. These units are designed from 1.5–1000 MHz bandwidths. They come complete with weather washer, stainless steel hardware, UHF or type N fittings, and can be mounted on ⅛″ thick entrance panels. Price, $53.

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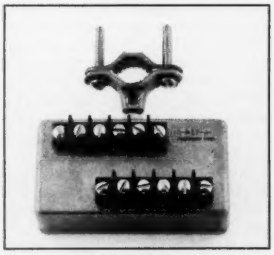

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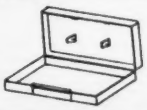

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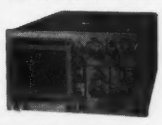

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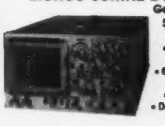
SCOPE PROBES
P-1 65MHz, 1x, 10x $19.95
P-2 100MHZ, 1x, 10x $26.95

Elenco 35MHz Dual Trace



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All scopes include probes, schematics, operators manual and 3 year (2 yrs for Elenco scopes) world wide warranty on parts & labor. Many accessories available for all Hitachi scopes. Call or write for complete specifications on these and many other fine oscilloscopes.

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Digital Capacitance Meter CM-1550B

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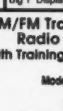
9 Ranges .1pf-20,000ufd .5% basic accy. Zero control w/ Case Big 1" Display

Digital LCR Meter LC-1801

$125
Measures: Coils 1uH-200H Caps .1pf-200uf Res .01-20M

Multimeter with Capacitance & Transistor Tester CM-1500B

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Reads Volts, Ohms Current, Capacitors, Transistors and Diodes / with case
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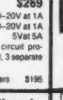
Function Generator Blox #9600 $28.95

Provides sine, triangle, square wave from 1Hz to 1MHz AM or FM capability

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14 Transistors + 5 Diodes Makes a great school project

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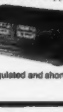
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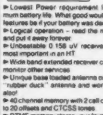
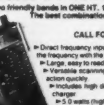
Triple Power Supply XP-620 Assembled $69 Kit $45

2 to 15V at 1A –2 to –15V at 1A (or 4 to 30V at 1A) and 5V at 3A
Contains all the desired features for doing experiments. Features short circuit protection, all supplies.

Quad Power Supply XP-580 $59.95

2-20V at 2A 12V at 1A 5V at 3A -5V at .5A
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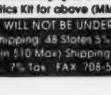
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HAM HELP

Your Bulletin Board

We are happy to provide Ham Help listings free on a space available basis. To make our job easier and to ensure that your listing is correct, please type or print your request clearly, double spaced, on a full (8½" x 11") sheet of paper. Use upper- and lower-case letters where appropriate. Also, print numbers carefully—a 1, for example, can be misread as the letters l or i, or even the number 7. You may also upload a listing as E-mail to Sysop to the 73 BBS, (603) 525–4438, 8 data bits, 0 parity, 1 stop bit. Thank you for your cooperation.

Needed: Service manual or copy for Kenwood TV-506 transverter, VFO-820, ICOM 251A. Also need manual for Johnson Mesenger 1 or 2. Will gladly pay copy and postage costs. *KS4S, Nyles McKeithan, 1308 North Pine Street, Lumberton NC 28358. (919) 738–1644.*

Need manual and schematic for Clegg FM-27 2m transceiver. Will pay copying costs. *Jon Danford AA0EQ, 2115 Joplin Av., Joplin MO 64804. (417) 781–5243.*

Wanted: 10m handheld "Handy" with crystals and instruction manual. Portable antenna. Small solar pack or light-weight, hand-cranking compact generator to charge deep-cycle battery pack. Needed for unusual DXing adventure. *H.L. KC6RKO. 249 E. Redondo Beach Blvd., Gardena CA 90248. Day: (213) 327–7777.*

Wanted: Manual/schematics for Knight Star Roamer by Allied Radio. Will pay for originals or copies. *Bob Van Rhee N8LAS, 1273 Kloap, Apt. H, Muskegon MI 49441.*

Need operating manual and/or service manual for NCR model 1014 computer so I can upgrade and operate packet and RTTY. NCR sold these to schools. Copy OK. Call (401) 723–5308 first if you expect money for it. *Joel S. Look W1KCR, 35 Goff Ave., Apt. 507, Pawtucket RI 02860.*

Wanted: IBM XT manual; ICOM HM 10 mike; Atlas DD-6C digital readout for Atlas 210X; Heath digital readout for HW-101; power supply for Commodore C-64. *A. Campo, 816 West Knapp Street, Rice Lake WI 54868.*

Wanted: CW filter (400Hz) and microphone for Heathkit HW-101 transceiver. Ideas for substitutes from original equipment welcome. Also interested in any modifications. Will pay costs and postage. *Edward J. Mathes, 1732 Beechwood Drive, Farmington NY 14425.*

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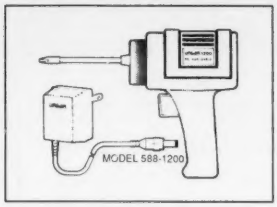


MOUSER ELECTRONICS

Mouser Electronics now stocks the Ungar 1200 rechargeable soldering gun powered by NiCd batteries. This cordless gun is suited for hard-to-reach areas and time when power is unavailable. Operating up to 30 minutes per charge (about 250 solder joints), this U.L.-listed unit is equipped with a standard tip. Also available are heavy duty and fine tips.

Price, $50. *Mouser Electronics, 2401 Hwy. 287 North, Mansfield TX 76063. Tel. (800) 992–9943; FAX (817) 483–0931.* Or circle Reader Service No. 212.

GAI SYSTEMS

GAI Systems has a new product directory and buying guide for amateur radio operators. Called *HamStuff,* the directory contains information about more than 1,000 vendors of ham radio products and services, and descriptions of more than 5,000 products. Part I, "Stuff to Do," includes chapters on youth activities, programs for disabled hams, organizations, and publications. Part II, "Stuff to Buy," has product descriptions. Part III, "The HamStuff Index," lists addresses and information on vendors. *HamStuff* is published by Walt Garrett NØMAL. He plans to issue annual revisions to the directory.

HamStuff is available for $19.95 plus $3 shipping and handling. Contact *Walt Garrett at (314) 831–6464/6918. GAI Systems Group, P.O. Box 5832, St. Louis MO 63134.* Or circle Reader Service No. 208.

A/V TECHNOLOGY INTERNATIONAL

A/V Technology International, Inc., presents ANTENNA ARRAYS SOFTWARE, which computes up to 16 dipole elements. The user can construct driven arrays configured as broadside, end-fire, and maximum radiated signal. You can display the results in a graphic or tabular form. The broadside array is comprised of parallel half-wave dipoles, main radiation lobes perpendicular to the plane of elements. In an end-fire array, main radiation direction is in the plane of the elements, and at right angles to the elements. ANTENNA ARRAYS demonstrates nearly infinite possibilities, even with few elements. Toggle to change display from vertical to horizontal; try rotating to change the polarization. View radiation patterns in both the horizontal and vertical planes.

Price, $60. Specify disk size. Requires IBM/compatible computer with MS-DOS, EGA monitor, and at least 512K RAM. Larger arrays are available as option. *A/V Technology International, Inc., P.O. Box 97, 432 Cherry Street, West Newton MA 02165. Tel. (617) 965–3866; FAX (617) 965–1865.* Or circle Reader Service No. 219.

MFJ

MFJ has just released the MFJ-1268 PC Memory Keyer, a combination of IBM/compatible software and hardware that turns your computer into a powerful memory keyer. It hooks up easily between your computer and radio. You get 100 function key macros that you can easily set to send any messages or characters. You can set a macro to send another macro. Other features include incremental serial numbering, speeds from 5–40 wpm, variable speaker tone (or speaker off), weight adjustment, and instant access to online help.

Price is $50, with MFJ's one-year guarantee. *MFJ Enterprises, Inc., P.O. Box 494, Mississippi State MS 39762. Tel. (601) 323–5869; FAX (601) 323–6551; (800) 647–1800.* Or circle Reader Service No. 211.

THE FORBES GROUP

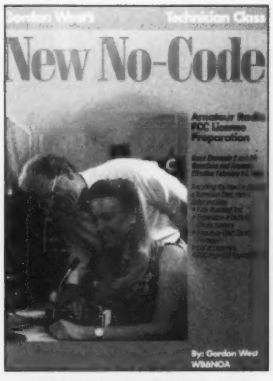
The Forbes Group introduces the 2m Ventenna™, which you can install in less than 10 minutes. You slip it over an existing vent pipe on the roof. Circumventing restrictive ordinances and covenants, it becomes part of the vent. Once installed, the Ventenna is virtually invisible. It covers the entire 2m band, and handles full legal power.

The 2m Ventenna is $40 plus $4 shipping and handling. *The Forbes Group, P.O. Box 445, Rocklin CA 95677.* Or circle Reader Service No. 207.

ELECTROSOFT

Electrosoft has released a new version of the CW-keyboard program and interface kit (described in the January 1991 "New Products") for IBM/compatible MS-DOS computers. The new version adds the capability to receive CW; the original program only transmitted CW. The program/interface receives CW from the receiver speaker and keys the transmitter via one of the computer's serial ports. It copies CW from 2–100 wpm, automatically tracking changes in speed. Received messages are displayed in reverse video in the upper window of the split screen display. Transmitted messages are copied from the bottom window to the top window using regular video display. Received and transmitted messages appear in the order they occur. An "R" in the top status line blinks brightly when the CW tone is present, helping the operator to tune the frequency and volume of the receiver for the best reception.

Program and interface kit, $55; program only, $25; upgrade kit, $30. Specify 5¼" or 3½" disk when ordering. The battery operated interface circuit takes less than an hour to build, and includes all parts plus cables, except for the speaker receiver connector and the transmitter key plus. *Electrosoft, P.O. Box 1462, Loveland CO 80539.* Or circle Reader Service No. 218.



MASTER PUBLISHING, INC.

WB6NOA's *The Technician Class New No-Code* 232-page book published by Master Publishing, Inc., has all the latest Elements 2 and 3A questions. Every question and the four possible answers are listed along with the actual FCC question number. The correct answer is listed right after the four possible answers, with information on why the answer is correct. This way, you don't have to flip back and forth between the back of the book and where you're studying. In addition, Gordon West includes charts, test and theory preparation, information on the Amateur Radio Service, how and where to take the exam, and how to fill out FCC form 610, which is bound inside the back of the book.

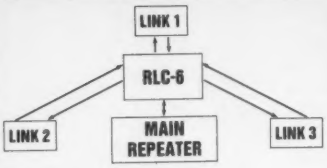
Price, $9.95. Look for it at your local Radio Shack or ham dealer! If you can't find it, call *Master Publishing, Inc., 14 Canyon Creek Village MS 31, Richardson TX 75080. Tel. (214) 907–8938; FAX (214) 669–4028.* Or circle Reader Service No. 220.

BelMERIT Corporation

A new product catalog details manufacturer BelMERIT Corporation's line of digital and analog multimeters, function generators, frequency counters, AC/DC power supplies, and accessories. Product specifications are included.

Price of multimeters ranges from $15 to $700. For a free catalog, contact *BelMERIT Corp., 17 Hammond, Suite 403, Irvine CA 92718-1635. Tel. (714) 586–3700; FAX (714) 586–3399.* Or circle Reader Service No. 206.

REPEATER LINK CONTROLLER



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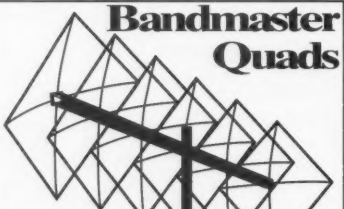

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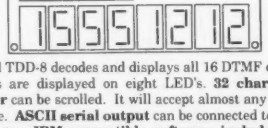

Model TDD-8 decodes and displays all 16 DTMF digits. Digits are displayed on eight LED's. **32 character buffer** can be scrolled. It will accept almost any audio source. **ASCII serial output** can be connected to your computer. **IBM compatible software included** for automated logging and alerting of user specified numbers. **IDEAL FOR UNATTENDED LOGGING OF YOUR AUTO-PATCH TRAFFIC!**

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THE TINY TAD

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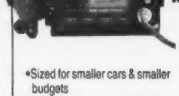

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LOOKING WEST

Bill Pasternak WA6ITF
28197 Robin Avenue
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The Great 220 Bandplan Debate

Will anyone win? I think it's rather obvious that the Federal Communications Commission was wrong when it confidently said that the amateur community would find a way to absorb activity previously in the 220–222 MHz spectrum into the 222–225 MHz band. Either that, or it had only localities like Norman, Oklahoma, and Hilo, Hawaii, in its bureaucratic mindset when, in the test of the report and order deleting 220–222 MHz from amateur use, it assured the ham radio community that a transition to a new and smaller 3-MHz-wide band would be without incident. The Commission may know how to write regulations, but it is now painfully obvious that it has no concept of humanity in general and human nature in particular. As a result of this lack of understanding of Homo sapiens' nature, the so-called "easy transition" has become an open war pitting special interest against special interest, and ham against ham.

As I write this column in early June, there are still 50 states comprising this nation, almost that number of concerned frequency coordinators, and at least three times that number of band plans for the reorganization of activity in the 1.25 meter band. Most of the proposals fall into one of two categories. They are either "altruistic" in offering (demanding?) an equal split of the pie for all mode users, or they are selfish in favoring one mode over all other interests. What I see emerging as the 0000 UTC on August 28th "Vacate Day" draws closer is a growing awareness among the minority spectrum users, i.e., the EME enthusiasts, the low-power CW and SSB DXers, the beacon owners, and hams of that ilk, that the majority of their peers will no longer tolerate their existence! That majority calls itself the "FMers."

Why FM Feels It Will Win

Let me begin by saying that I have no ax to grind for or against either side. The time I spend on 1.25 meters is as a user of the N6ENV repeater's autopatch and 223.5 MHz simplex. Sometimes I wander to N6NFQ's fine system, or that of the long-established Valley Good Guys Amateur Radio Club, but that's about it. I actually prefer one-on-one QSOs, all but impossible on repeaters. In years past, I have spent many happy hours in 6 and 2 meter AM and SSB rag-chews and I have chased VHF DX on SSB. Long before most hams realized it was possible to talk from Brooklyn, New York, to Atlantic City, New Jersey, directly on 6 meters, I had racked up a fairly impressive total of 42 states worked and 37 confirmed while running only 7 watts AM, crystal-controlled on 50.4 MHz. In 1969, I also codesigned, built and installed WA2ZWP—the nation's first 15 kHz split-split repeater. (And I thought I had proven that 15 kHz would not work, but nobody listened—hi.) For the past 28 years I have been writing about VHF/UHF, FM and repeater matters for *73 Magazine*, and I have served as a frequency coordinator on two coasts. I will not say that I have "done it all"; far from it, but what I have come to possess as a result of being on both sides of the fence is a far better understanding of certain amateur radio political issues than most.

So let's get right down to the nitty-gritty of what has happened here and in most other urban areas. Simply, places like Southern California have now decreed that 222–225 MHz shall be forevermore an FM band, with a smattering of packet begrudgingly welcome. Other areas, mainly those under the umbrella of the Mid America Coordination Council (MACC), have taken the view that FM will have to vacate a part of the band to make way for the re-allocation of weak signal modes. This will work in MACC territories such as Nebraska, Iowa, Kansas, Missouri and the like, but what is going to happen when the MACC-affiliated Illinois Repeater Association attempts this in Chicago where they have every channel pair filled from 222–225 MHz? I frankly doubt that any repeater will go off the air if a repeater coordinator says to vacate spectrum to make way for the displaced users of 220–222 MHz. And, if a coordinator decides to flex its muscles and try to force systems to vacate, the coordinator will either be ignored, or more likely, be sued.

But the League Will Solve It?

Let's put ourselves into the position of a 220 repeater owner who is told by a frequency coordinator that he has to take his system off the air to make way for another mode. What do you think his reaction will be?

Keep in mind that he already has the frequency. He has the gear. He has the repeater site and most important, he has the backing of his users—the same users who vote for the ARRL director and vice director every two years. So he picks up the phone, dials up his director and says something like: "This is Joe Jones and I own the 222.90 repeater that's been told to get off the air. Mr. Director, you seem to forget that the political power in ham radio lies in only two places: the DXers and contesters with their money, and us repeater folks with our votes. It's not with that handful of crazies who bounce signals off the sun and the moon. Now, do you or don't you want to be re-elected next year?"

If you think this won't happen, and that the ARRL hierarchy won't bend to this pressure, you are very naive. The ARRL Board of Directors is the epitome of the "Old Boy Network." Elected League officials know where their bread is buttered and where the votes to keep them in office come from. Because of this, they instinctively bow to popular political pressure. Look at the turnaround they did on no-code when they realized that code-free licensing would be more popular then unpopular.

What about a quick response by the ARRL for a new approved "Official ARRL 222–225 MHz Band Plan"? If the directors do anything at all—which I tend to doubt—they will pigeonhole the subject by sending it back to the VRAC and VUAC to discuss for the next decade. That way, they make no decision and placate everybody. How many years did it take the ARRL Board of Directors to decide that all three band plans for 2 meters were proper? I think it was 18 years, to be exact. I do not expect the ARRL Board of Directors to do much else but procrastinate, and point to their "local option band plan" escape clause as a way of collectively distancing themselves from this ham community need.

"As we get more no-code Technicians, there will be a call for more and more repeaters for them to operate on."

Let's Go to the FCC!

I have heard that a few of the EME folks in Texas are thinking of filing a petition with the FCC to request partitioning of the 1.25 meter band to take 222–223 MHz as a narrowband-only emissions subband, and 223–223.5 MHz as a not-to-be-used buffer zone to protect the noise floor of the lower 1 MHz. I suspect that the FCC will get a lot of petitions like this over the next year or so. I also doubt that any will ever see the light of day, for two reasons.

First off, the FCC will ask the ARRL what to do. The ARRL will come back and say, "We don't know." The FCC will then say, "If the ARRL has no idea what to do, and they are the representatives of the wishes of the 'majority' of radio amateurs, how can we, the FCC, know what's best? Maybe we should let it alone and see what happens over the next several years." And, mark my words, they will.

The Law of Supply and Demand

There is something else that the average ham, in his altruistic zeal, tends to overlook: the law of supply and demand and its effect on the hobby. From 1950 to 1968 (approximately), the national (not California) demand was for VHF and UHF gear that was experimentally oriented. In the old days, all of us were "technicians building our own gear," and we were all DXers in the sense that we were all striving to get a better signal to the guy we were talking to. That began to change in the mid-1960s when Ed Clegg W3LOY (Clegg Labs) began putting high quality, made-for-ham-radio transmitters, receivers and transceivers into the hands of amateurs at prices well under what they could home-brew a piece of gear for. Then came Swan with its 250 and 250C: a pair of radios that radically changed the operating habits of those of us on VHF and UHF.

By 1969 or 1970, the rest of the ham world had discovered what California hams had known since the 1950s, FM and repeaters. With the advent of the six-channel Regency HR-2, the six-channel Inoue IC-2F and the three-channel Galaxy unit that never worked, the face of VHF and UHF operating was again changed forever. For all intents and purposes, 2 meters, then 450 followed by 220 and the rest of VHF and low UHF, became "operator" bands with the "experimenter" not just taking a back seat, but literally being phased out.

What does this have to do with the law of supply and demand? Just this: How much SSB and CW gear is made vs. the number of FM transceivers and handhelds? The manufacturers are well aware that the big money lies in two, and only two, markets. These are HF SSB and VHF/UHF FM. True, there have been spurts of weak signal equipment coming to the market, but these units are for the most part nothing but derivatives of existing HF transceiver designs. They come and go quite fleetingly. In fact, the only reason that we are seeing so much new 6 meter gear is because 6 meters has been opened up in most of Europe.

For three decades, the United States accounted for 99% of the potential 6 meter market, and for the past two and one-half decades there has been only a smattering of advanced gear for that band. Most serious 6 meter DXers still prefer the old tube-type Drake TR-6 to anything else. I saw one sell for over $1,500 in the Dayton flea market in 1990. That was three times what the radio sold for in 1968!

The new FM gear for the 222–225 MHz band has either been designed, is in the process of manufacture, or is already on the boat on its way over. Unlike a decade ago, the people who manufacture and import ham gear are not the quiet fellows they were. The amateur radio industry knows that it supplies a special interest product, and to survive, it must sell mass quantities of "product" into mainline use. On HF that means a transceiver for each price range, with 99.9% of the activity being CW and/or SSB.

The market on VHF and UHF is FM. The big three know it. The smaller sup-

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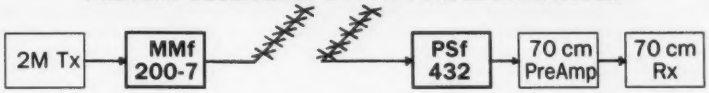

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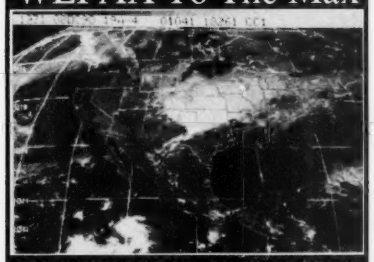

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pliers also know it, and I think that companies like Radio Shack, Sears, Ward's, Penney's, K-Mart and countless others—others who I believe will come to mass-market ham gear—will also show that they understand this basic marketing strategy. (You should not be all that surprised that I am predicting that a lot of the nation's mass-market marketers will eventually join the ranks of those selling amateur radio equipment. To me, this deduction is as simple as the two words "no-code.")

I think the ham industry—at all levels—is now geared to no-code. Radios are becoming simpler to operate, with much of what's needed to get on the air being preprogrammed into ROM. Plug in an antenna, turn on a radio, key up a repeater, and talk. Not really that different from a TV set, a stereo, or—heaven forbid—a CB radio.

In years past, the manufacturers and importers of the gear we "must" all use refrained from speaking out on volatile subjects for fear of losing business to one another, or to the realm of the home-brewer. But that, too, has all changed. Parts are very hard to come by, and they are getting harder to find every day. This makes the home-brewing of any gear, let alone something like a Kenwood TS-950 or an ICOM IC-781 or a Yaesu FT-1000 (did I leave anyone out?), all but impossible for the average amateur. Therefore, for most of us, this means we buy what's on the market or we do not get on the air.

And Then There Is Politics

Then there is the political impact of no-code for the remainder of this decade. If you are watching the FCC's Tech class licensing figures—and I do—then you see a rather interesting exponential growth pattern developing. Admittedly, it's very early to accurately predict the outcome a decade from now, but if you just project current growth patterns for Techs from the past three months, you find a steady 270% increase each month. If this pattern were to continue for only, say, two years, the code-free licensees would be the dominant license class in the nation. And, with numerical dominance comes political desire.

When the no-code operator becomes the dominant political voice determining the destiny of United States amateur radio policy—and the I believe no-code ham will become that kind of political force—what will the VHF and UHF bands be like? I think that the answer is "utility communications" with little or no room left for exotic experimentation and non-mainline operation.

What Does it All Mean?

I have spent the preceding paragraphs trying to paint what I feel is a realistic national and international picture for you. You don't like it? I have to tell you—neither do I. But hams, myself included, are known to be far more altruistic than realistic. To those of you who would find it far easier to kill the messenger than to accept the reality of the message, I can only offer a bit of pity. You either live in a rather insulated world or have listened to one squelch-crash too many.

When I say that this is only the first of many times—most yet to come—when spectrum will be lost to non-amateur use and we will again have to contract our operations, do not think that my words are insanity. Rather, sit down, read the background information available on the upcoming WARC sessions, and decide for yourself. The cards are stacked heavily against the minority of weak signal enthusiasts, and well in favor of "Joe Ham" who has gone out and spent $400 for a transceiver with "...all those repeaters built in."

I do not see any real future for the weak signal experimenter and exotic mode operator on 222 MHz, or on any other VHF or UHF band, except those in the GHz range—if we still have any of these left after WARC '92 and WARC '93.

I know that forcing the creation of a subband that will be looked on by the masses as the domain of the elite will only bring provocation. Trying to forcibly take more then the masses are willing to give will only bring on an intermode war that the masses, by sheer number, will have to win. Trying to forcibly create a subband by FCC regulation will bring a negative response from the majority of the amateur community, and possibly from the American Radio Relay League. Yet, is it right for the masses to tell the few to go away forever? Is it right for "them" to tell "you" that "you" cannot enjoy your interest because "they" will not give you the room to do so?

Maybe We Need Two Bandplans?

Some have suggested that we have a pair of new 222–225 MHz bandplans. You might say, "one for the crowded city" and another for "the great outdoors." I fear that this approach is not a real solution. Rather, it is a Band-Aid™ that will work only as long as the "great outdoors" remains sparsely populated. No-code will change all that.

As we get more no-code Technicians, there will be a call for more and more repeaters for them to operate on. A lot of these machines will be outside of the traditional urban regions where 2 meters and 440 MHz are already congested. As a result, many will be forced to make their home in the 222–225 MHz band. These new repeaters and their users will erode the "great outdoors" bandplan and urbanize it. The DXer and weak signal experimenter will again be forced off, and feelings will once again be hurt.

To understand what I am saying you have to let go of today. You have to visualize the future and think in numbers of tens of thousands of new hams coming to the VHF and UHF bands in the next several years. The vast majority of them will be demanding telephone-like quality to their communications—be it voice or data. Having multiple bandplans based on current activity is closing one's eyes to the future. Have we not done that enough already? 73

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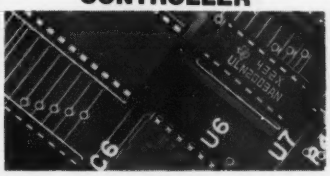

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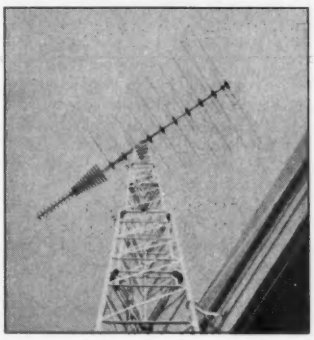

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RF Filters for VHF and Above

With all the laser applications now seeded in the last few columns, I want to sit back and see what develops. I plan to continue my pursuit in this part of the spectrum, and I'll be glad to pass on information and applications you want to share. This month, in response to questions, I will cover RF filters and expand on a few applications. The beauty of some of these filters is that they're almost ready to go, right off the shelf. I'll start by describing some of the filters that I've used in past years which still have desirable traits today.

The subject of filters generally comes up when you have a piece of equipment that works, but needs improvement. This was the case with a simple 2 meter FM rig I used back in 1960. The receiver had a 6BQ7 for the front end, and the transmitter was home-brewed with 6AQ5 tubes in the multiplier string. Normally this tube was used for a receiver audio stage, but it worked well at 2 meters mainly because it was available.

The problem I was having was a desensitized receiver, which I traced to several local strong high power commercial transmitters. They were tearing up my receiver; though they were located over 10 MHz away, I could hear them in several spots on the 2 meter band.

You might wonder what this old rig has to do with the modern radio. Well, some of its problems still plague us, especially RF de-sensitization.

Considering their small size, circuits in today's radios work fantastically well, their quality and sensitivity far exceeding that of early radio. But wideband coverage radios still suffer from adjacent channel interference, or poor selectivity. Selectivity is the radio's ability to operate to full specifications while functioning near an off-frequency transmitter.

Being Selective

What happens in typical de-sensitization is that your receiver goes numb. If you're mountain topping or on Field Day, the view of the city may be great, and the location ought to be great, too, but you get poor performance. You might not even know that your transmitter is getting out, since your receiver is operating poorly. Besides poor performance, the only other clue might be some trash in the unsquelched condition. The problem is quite simple: front end overload or a de-sensitized receiver.

What you usually find at these locations are commercial radio repeaters, or local TV or FM stations, who also thought the location was great. Trying to operate an unmodified radio, like a plastic HT with miniature filter circuits, near their high power transmitters will only cause you grief. About the only radios that don't suffer from this problem are some of the single or multichannel mobile "taxi" or "police" radios. They have quite a few selective tuned circuits on the receiver input that reject nearby off-frequency signals. Note: these radios have the bandwidth of their front ends reduced from several megahertz (our HTs) to a fraction of that bandwidth.

Just as the commercial radios solved this problem, so can we. The solution is a filter installed on the antenna of our radio to limit or reduce the strength of adjacent RF signals. We design the filter to pass only that portion of the 2 meter band we desire, and to reject other frequency components. Most interfering transmitters operate at 152 MHz and above, making a high *Q* filter very effective in limiting what the receiver input circuit can see.

On field trips I usually use an ICOM IC-02, which is one fine radio unless you're operating near high power TV or FM transmitters. However, connecting a bandpass filter tuned to the frequency of operation restores my IC-02 to full performance.

First, Find the Right Can

The filter I constructed years ago for much the same problem consisted of a beer can cavity filter. It was a steel or tin can, not aluminum. Find one of the larger soup cans that will take solder. To get the proper length of can for your particular application, you can try other cans; tennis ball and fruit juice cans are suitable for frequencies of 2 to 3/4 meters. Other types of cans can be used, depending on length and solder-ability.

The coaxial connectors are mounted on opposite sides of the can, about an inch and a quarter from the grounded end of the filter. The coupling link runs from the connector near the center element, then angles down and is soldered to ground. The spacing on the link is adjusted for insertion loss and impedance matching. The bottom of the filter is covered by a copper or tin plate, or anything that will take solder. The can forms a cavity that is adjusted by a small value variable capacitor mounted at the top of the element.

The capacitor resonates the cavity to frequency. Connect the cavity in line. While listening to an active repeater, vary the capacitor for the highest S-meter reading you can get. This is a hokey method of setting the cavity to frequency, but if you do not have any test equipment it will work quite well.

Do not try to transmit through the filter if it will not pass the receive sensitivity test. When it does pass this test, use only low power until you have thoroughly evaluated the filter. There should be almost no difference in S-meter readings with the filter in or out of the circuit. See Figure 1 for construction details.

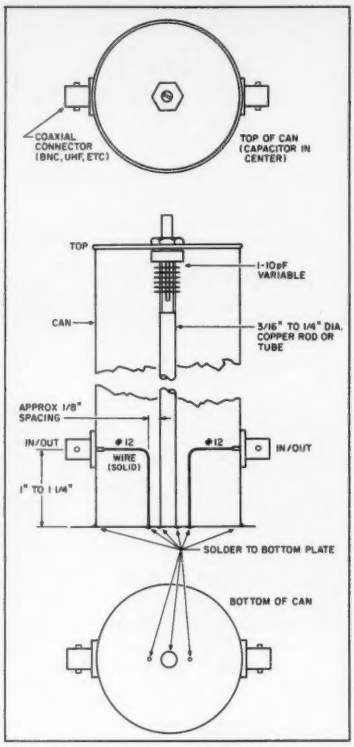

Figure 1. Schematic for the 2 meter, 16-ounce beer can cavity filter.

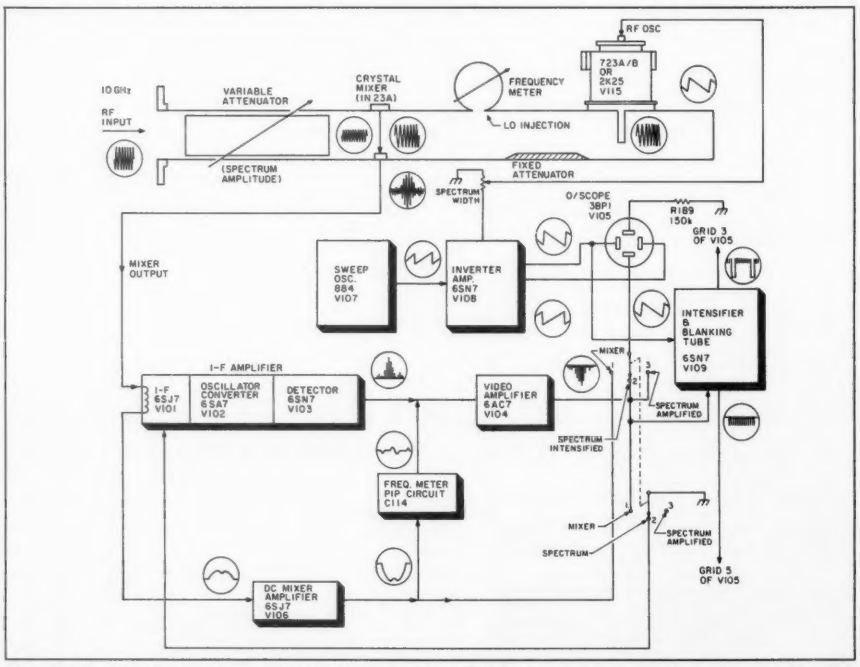

Figure 2. TS-148 surplus spectrum analyzer block diagram. The 10 GHz frequency meter in the photo was removed from this test set.

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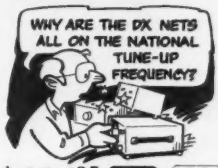

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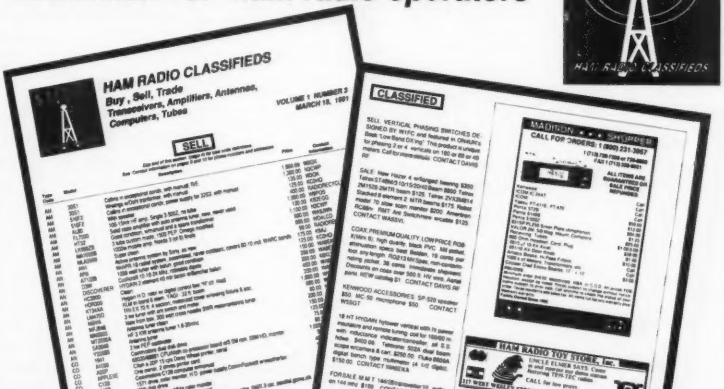

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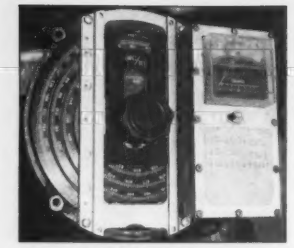

Photo. 10 GHz frequency meter. TS-148 dial removed from test set. The waveguide opening is in the rear.

Heat, Power, and Size

My filter had a very sharp peak at the frequency it was adjusted to, allowing operation on a very narrow band of frequencies. You can use the filter for transmitting, but the power must be low (5 to 10 watts maximum) due to component heating. You can check the filter's performance on transmit with your SWR bridge. It should give a nominal low reading. To obtain minimum SWR, some positioning of the input/output links may be necessary. With the filter in place, adjacent transmitters should not give you further problems.

If you change your frequency of operation, don't forget to change the filter tuning, as it is quite narrow. I usually set mine and use it only on certain hilltops, removing it when I am mobile. This avoids distracting problems that could come up while I'm driving. Normally, a filter is not needed in mobile applications, as the location changes rapidly, especially on the California freeways.

A variation of this simple cavity type filter is the trough line circuit, housed in a rectangular enclosure with one side open. There is nothing wrong with using either type of filter for transmitting, but you must keep the power low. Insertion loss runs about 1/2 dB. Commercial, high power transmitters use the same type of filter concept, but the design incorporates a very large cavity structure nearly 1/4 wavelength long. With a tin can, losses are greater. A small filter can't handle very high currents.

As noted, short filters using variable capacitors should be limited to transmitters of 10 watts or less. A 1/4 wavelength filter for 2 meters is almost 20 inches long, and not very portable. It must be made of heavy and durable material, considering the high RF currents it is subjected to. You probably have a similar filter in your local repeater duplexer to connect the receiver and transmitter to the same antenna and to reject off-frequency signals.

Mailbox Comments

Robert DePaul of Union City, New Jersey, is converting a TS-148 radar test set for use at 10 GHz. This test set is available from many surplus dealers. While it is tube type and somewhat bulky, I used two of them in my first 10 GHz test sets to set up, with my microwave group, 10 GHz transmitters.

The TS-148 operates from 8.5 to 9.8 GHz. This unit is a spectrum analyzer of the old world, about 1950 or '60 vintage. It has an o-scope presentation with variable frequency meter (mechanical) built inside the case. It's about 14 inches square (front panel) and 16 inches deep. Power is from 110 AC mains.

Robert's conversion involves removing the klystron tube and breaking off the klystron's brazed limit screw. But you can also file off the tube's brazed lock nut, which allows you to adjust the screw, compressing the cavity past the factory set limit. This raises the frequency for operation on the 10 GHz band.

To convert the wavemeter for 10 GHz, remove the front cover plate to access the dial. Set the dial to the highest frequency (a 966 dial reading = 9.66 GHz). With the unit face up, partly unscrew the four corner screws holding the dial plate "MC/10." Loosen the top screws more than the bottom screws. Now, carefully raise the top of the dial holder and fudical with the MC/10 dial set to 966; drop two tracks with the MC/10 dial, now set to read 899.5 (8.995 GHz).

This makes the cavity electrically smaller, and resonant on the 10 GHz ham band. Each frequency meter converted in this manner will be different, but close to the reading I obtained on re-calibration on 10 GHz, as follows: 10.280 GHz = 935.6; 10.250 GHz = 933.9; and 10.220 GHz = 932.2. This should guide you on what to expect if you do your calibration in the same manner.

If desired, you can return the meter to its original calibration by raising two tracks. If you want this reversibility, be careful when making the modifications. Before you set the unit on its bottom, tighten the screws to prevent the dial from shifting. See Figure 2 for a block diagram of the TS-148. Next month we will cover the TS-147 companion.

As always, I will be glad to answer questions about microwave or related topics. Please provide an SASE if you wish a personal reply. Best 73's Chuck WB6IGP. 73

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John R. Somers KC3YB
Crisfield MD

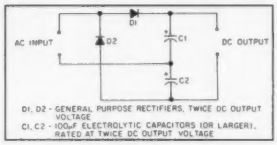
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Fig. 1.

Listening to Your Rig While Doing Something Useful

Many times I've wanted to monitor a frequency for a scheduled call, or for a net to start, or to listen for some DX activity, but had chores I should have been doing that would keep me out of hearing range.

One solution was to turn the audio way up. The XYL soon put a stop to that. Another solution might have been a long earphone cord, but that probably wouldn't have been compatible with the hedge clipper.

A simple solution to the problem was provided by coupling an inexpensive FM transmitter module to the receiver audio, and listening on a portable FM receiver.

Circuits for short-range FM transmitters have been published, and several are available commercially. Almost any of these would work, but the easiest approach was to use the FM-1, sold by Ramsey Electronics in kit form. It is quite small, inexpensive, and can easily be packaged with a battery and microphone cartridge and placed next to the speaker or taped to an earphone. However, better sounding audio will result if the earphone jack output is fed through a reversed audio output transformer directly to the module, bypassing the microphone. In this case, a 500–1,000 ohm potentiometer across the unit's input may be needed to supplement the receiver's volume control.

Figure 3 shows a circuit that will accomplish this. Just tune to a quiet spot on the FM broadcast band and adjust the input levels for best fidelity.

I've actually used this gadget with an FM-earphone radio while mowing the lawn. And, I've had the added advantage of being able to QSY to some soothing music when the QRM got too rough.

Marty Kleinfeld K1FHR
Naples FL

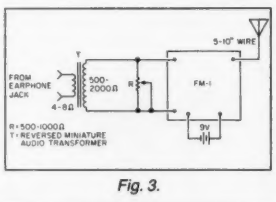

Fig. 3.

Adding a Gain Step Switch to the LM386 AF Amplifier

The LM386 is a very useful audio amplifier in an 8-pin DIP package. Variations of the LM386, identified by suffix numbers −1 to −4, provide up to 0.7 watts of audio to a low impedance speaker or headphones. This chip contains an internal circuit accessible at pins 1 and 8, so the overall gain can be set at 50 to 200 times by an external resistor and/or capacitor.

In some instances it can be desirable to limit overall gain to less than maximum, which corresponds to maximum current drain, especially in battery-operated equipment. A 10k ohm audio taper potentiometer is used normally to control the input level. A single-pole, three-position switch has been added so that the maximum gain can be set as desired between 50 and 200 times.

Figure 2 illustrates a typical AF amplifier using the LM386. Provisions for a speaker and phone jack are included. The speaker is silenced when headphones are plugged in.

J. Frank Brumbaugh KB4ZGC
Buffalo NY

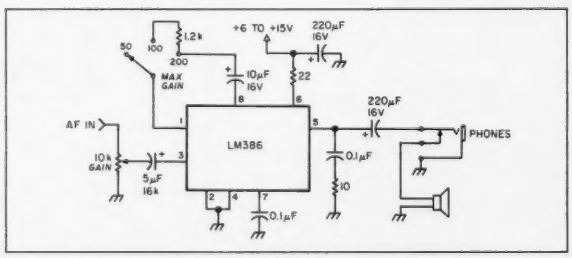

Fig. 2.

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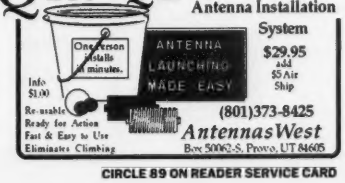

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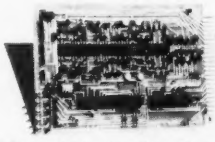

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The Penguin Islands

There's a new DXCC country. The number of DXCC countries has risen to 323 with the addition of the Penguin Islands to the list, almost a year after the application was submitted to the ARRL. The following ARRL Amateur Radio News Release dated May 31, 1991 summarizes it nicely:

"By unanimous vote (7–0), the ARRL Awards Committee has ACCEPTED the recommendation of the ARRL DX Advisory Committee that the Penguin Islands (ZS1) be added to the ARRL DXCC Countries List. That recommendation was based on Point 3(a) of the Countries List Criteria (separation by another DXCC country).

"The Penguin Islands, administered by South Africa, are situated off the west coast of Africa. Namibia (V5) separates the islands from South Africa (ZS1-6).

"To the best of our knowledge, there have been two creditable operations from these islands: ZS9A/1, DK9KX/ZS1 and DL8CM/ZS1 in July 1990, and ZS9Z/1 in December 1990.

"QSL cards may be submitted for DXCC credit beginning September 1, 1991. Cards submitted before that date will be returned without credit."

The ARRL news release mentions the callsign DK9KX/ZS1, but DK9KX (and other operators) actually signed ZS9AAA/1, not DK9KX/ZS1, during the first operation from the Penguin Islands. The callsign DK9KX/ZS1 is mentioned on the DXpedition QSL card, along with DL8CM/ZS1 and ZS9A/1, but I have found no one who has received a confirmation for a contact with DK9KX/ZS1.

QSL routes for these operations are: ZS9A/1 via OH2BH; ZS9AAA/1 via DK9KX (direct only); ZS9A/1 via ZS9A; and DL8CM/ZS1 via DL8CM.

Jarvis Island

Since before the AH3C/KH5J DXpedition (April 13–22, 1990), the question of separate country status for Jarvis Island has gone unanswered. This possibility is being tested by an application for separate country status submitted this past May by several of the AH3C/KH5J operators.

Eric K3NA wrote a lengthy and well-documented application for separate country status during early 1990, but evidently his document, if it was submitted to the ARRL, has not been acted on. During this past May another attempt at making Jarvis Island a separate country was launched by the AH3C/KH5J operators. Their application, which appears to use most, if not all, of the data compiled by K3NA, is based on Point 3(b) (a part of the Criteria that the DX Advisory Committee is attempting to change) of the DXCC Countries List Criteria: "Where two islands, of the government under Point 1, are totally separated by an intervening DXCC country (also under Point 1), 'each' island counts as a separate DXCC country . . ."

This application shows that Jarvis Island is separated from Palmyra Island (the nearest U.S. land) by sovereign Kiribati territory. It is well-written and should give the DX Advisory Committee plenty to think about.

Myanmar (Burma)

The Myanmar DXpedition, led by Romeo 3W3RR (1S1RR, YAØRR, etc.), is now scheduled to begin in late August or early September. The callsign has not been made public, to prevent its use by pirates. The callsign will be announced about five days before the DXpedition begins. Romeo has a license that has been accepted by the ARRL. Romeo and company will operate from one of two possible sites: an island off the coast of southern Myanmar, or somewhere within the "Golden Triangle."

3CØ Annobon (Pagalu)

Annobon, or Pagalu, whichever name you wish to use, will be activated in August by the Radioclub Garrotxa and the STC URE Garrotxa. Transportation and licensing have been arranged, but the exact dates in August have not been announced. Contributions for this DXpedition may be sent to Radioclub Garrotxa, P.O. Box 56, Olot, 17800 Gerona, Spain. Thanks "DX News Sheet."

VP8 South Sandwich Island

The South Sandwich Islands DXpedition is a go again! This DXpedition is associated with the group that aborted their DXpedition last December. Eight operators, not yet identified, are scheduled to land on South Thule Island December 6 and be picked up on December 20. The research vessel *Abel J.* will provide transportation. According to the announcement received from KA6V and AA6BB, in order to discourage pirates, the callsign will not be released until the operation actually begins.

KA6V and AA6BB noted in their announcement, "Altho' we have some finances in the account, we do need to call upon your generosity. This new ship will cost only $50,000, which is considerably better than the cost of last year's vessel . . .$100,000. The cost of the vessel is the reason last year's DXpedition was cancelled." Please send contributions to AA6BB.

USSR—Oblast Ø52

Alex UA4HVV, who was active earlier this year as UA3Y/UA4HVV, will operate from oblast Ø52 during the last two weeks of August. He will sign UI7T/UA4HVV from a location called Dinosaur Plateau at 10,000 feet elevation. This location, according to Ed NT2X, has dinosaur footprints recorded in lava. Is this the first recorded hotfoot? QSL via UA4HVV. 73

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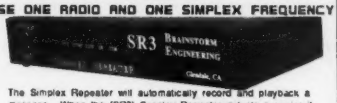

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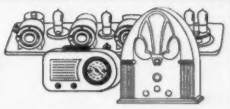

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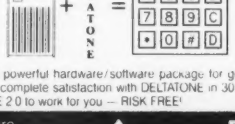

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SPECIAL EVENTS

Ham Doings Around the World

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the January issue, we should receive it by October 31. Provide a clear, concise summary of the essential details about your Special Event. Check /HAMFESTS on our BBS (603–525–4438) for listings that were too late to get into publication.

SEP 1

INDIANAPOLIS, IN The Central Indiana Hamfest/Computerfair will be held at the Indiana State Fairgrounds' East Pavilion Bldg. This is brought to you with the help of the Ivy Tech ARC. Open from 8 AM–4 PM. Admission $4 at the door, accompanied children under 12 free. Free parking. Booths with tables $10 ea.; without tables, $5 ea. Advance reservation deadline is Aug. 15th. Send payment to ***Central Ind. Hamfest, c/o Leo Doyle KE9TS, PO Box 20158, Indianapolis IN 46220.*** For info call ***(317) 251–9833*** or ***(317) 352–0136.***

SEP 6

CAMILLUS, NY VE Exams will be held at the Town of Camillus Municipal Bldg. starting at 7 PM. Fee for Technician through Extra class tests is $5.25. Talk-in on 147.300. Contact ***John Patchett KB2ERJ, (315) 487–0298.*** Please bring two forms of ID and a copy of your license.

SEP 7

WESTBORO, MA The Minuteman Repeater Assn. will hold the MMRA Flea Market at the Westboro MA High School. Advance tables are $10, floor space $5, before Sep. 5th. After Sep. 5th, tables are $15, floor space $8. Admission $2. Doors open at 8 AM for vendors, 10 AM for buyers. Send table requests and pre-payment to ***MMRA, PO Box 2282, Lexington MA 02173.*** For info call ***A. Morrison N1BHI, (508) 481–3878.***

PORT COLBORNE, ONT. CANADA The Welland County ARC will host a Ham Radio & Computer Flea Market at the Bethel Community Centre starting at 9 AM. Set-up at 7 AM. Admission $3 per person; children 12 and under admitted free. Indoor tables $3 ea. Outdoor tailgaters $1 ea. Ladies bake and craft tables. For info or tables call ***Dave Green VE3EOQ, (416) 788–9926*** or ***Tom Nelson VE3PSB, (416) 732–2363*** Talk-in: 147.30/.90 VE3WCR repeater and 146.52 simplex.

UNIONTOWN, PA The Uniontown ARC, Inc. will hold its 42nd annual GABFEST at the club, located on the old Pittsburgh Rd., just off Rt. 51 and the 119 bypass (40 miles south of Pittsburgh PA). Free parking. Free Swap & Shop set-up with registration. Advance tickets $3 or 2/$5. Talk-in: 147.045/.645 and 144.57/145.17. Contact ***John T. Cermak WB3DOD, PO Box 433, Republic PA 15475. (412) 246–2870*** or ***(412) 246–9383.***

TOPEKA, KS Washburn University, the last municipally owned university in the nation, will sponsor a Hamfest through its radio club, from 9 AM–5 PM in the Whiting Fieldhouse at Washuburn Univ. Admission $3 in advance, $5 at the door. Children under 10 admitted free if with an adult. Swap tables $5 in advance, $7 at the door (includes one admission ticket). Set-up at 7 AM. License Exams. Talk-in: 146.955 – WV0S repeater. Contact ***Washburn Radio Club, c/o Rob Nall WV0S, 2612 SW Arrowhead Rd., Topeka KS 66614. (913) 272–3559 (evenings).***

ERIE, PA The Radio Assn. of Erie will sponsor a Hamfest at Rainbow Gardens, adjacent to Presque Isle State Park. Free parking. Wheelchair accessible. Admission $4. Tables $8 (electricity available). VE Exams at 8 AM at nearby Villa Maria College. Talk-in: 146.01/.61. Call ***Eric N3HUM*** at ***(814) 474–2120,*** or ***Tom N3HPR, (814) 833–1640,*** or write ***RAE, PO Box 844, Erie PA 16512.***

LA PORTE, IN The Michigan City ARC and the La Porte ARC will co-sponsor the La Porte County Summer Hamfest at the La Porte County Fair Grounds. Free parking and free outside Flea Market. Set-up at 7 AM local time. Gate opens to the public at 8 AM local time. Donation $4 at the gate. Tables $5. Talk-in: 01/61, 37/97 or 52 simplex. Contact ***Gene Ward KD9VB, 312 Ash Pkwy., Westville IN 46391. (219) 785–4295.***

WARSAW, IN The American Red Cross ARC of Warsaw, IN, will sponsor the First Ever ARC II Hamfest at the National Guard Armory located 2 miles north of Warsaw. Gates open at 7: AM sharp. Admission is $3.50. Indoor tables are $5. Outdoor spaces are free with admission on first come, first served basis. For info/table reservations, call ***John Sparks, (219) 269–5187, after 3 PM.*** To reserve tickets send check or MO to ***American Red Cross A.R.C., c/o John McClements WB9FIF, 113 15th St., Winona Lake IN 46590.*** Talk-in: 146.985/442.550.

SEP 8

BUTLER, PA The Butler ARA will sponsor their 14th annual Hamfest at the Butler County Farm Show Grounds at Roe Airport from 9 AM–4 PM. Overnight campers welcome. Free outside Flea Market. Indoor vendor's space $10 per 8' table. Admission $1, children under 12 free. Handicap parking available. Mobile check-in till noon on 146.52 (W3UDX) simplex. Talk-in: 147.96/.36 (W3UDX). Fly-in (Butler-Roe Airport) 122.7 MHz. 80/100 Av Gas Avail. Contact ***Chairman WA3BVQ, RD 5 Box 8815, Slippery Rock PA 16057.***

JOLIET, IL The Bolingbrook ARS will hold its Seventh annual Hamfest/Computer Fair at the Inwood Rec. Center beginning at 8 AM. Tickets $3 in advance, $4 at the gate. VE Exams from 9 AM–Noon. Call ***(708) 759–7005*** for info.

NORTHWEST, OH The Findlay Radio Club will host its 49th annual Hamfest at the Hancock County Fairgrounds, beginning at 8 AM. Advance tickets $4, $5 at the gate. Send SASE with your payment to ***FRC Tickets, Box 587, Findlay OH 45839.*** First table $12 (includes admission for 1), additional tables $8 ea. Send SASE with your payment to ***FRC Tables, Box 587, Findlay OH 45839.*** Make checks payable to ***Findlay Radio Club, Inc.*** Talk-in: 147.75/.15 MHz; 449.15/444.15 MHz.

MONETT, MO The Ozarks ARS will hold its annual Club Congress and Swapfest at the Monett City Park (junction of State Hgwy. 37 & US Hgwy. 60) starting at 9 AM. Bingo at 10 AM, pot-luck dinner at 12:30 PM. Talk-in: 146.37/.97 MHz. Call ***(417) 678–3375*** for info.

S. DARTMOUTH, MA The South Eastern Mass. AR Assn. will hold their Fourth annual Hamfest/Flea Market from 8 AM–3 PM at the club grounds, 54 Donald St. Admission $2. Table space $8 in advance, $10 at the door. VEC Exams. Talk-in: 147.000/.600 and 145/490/144.890. Contact ***Michael Enos, PO Box 9064, North Dartmouth MA 02747.***

SEP 14

LOS ALTOS HILLS, CA The 1991 Electronics Flea Market, sponsored by the Perham Foundation to benefit the SPECS Users' Group, will be held at Foothill College from 8 AM–2 PM at Parking Lot "C." Please park legally. Buyers free. Sellers $10 per vehicle (2 spaces). For License exam info call ***(408) 255–9000.*** Talk-in: 144.67/145.27 MHz, SPECS repeater.

SEP 15

GAINESVILLE, GA The Lanierland ARC Hamfest will be held from 9 AM–3 PM at the Georgia Mt. Ctr. in downtown Gainesville. Set-up 6–9 AM. Indoor Flea Market only. Tables $10 each. Advance tickets are $4, $5 at the door. FCC Exams at 8:30 AM sharp. Contact ***Rick Coker AB4GS, 5417 Raintree Trace, Oakwood GA 30566. (404) 967–2087.***

BEACH HAVEN, PA The Columbia-Montour ARC will sponsor a Hamfest/Computer & Electronic Fleamarket at the Beach Haven Carnival Grounds, beginning at 8 AM. Free parking. General admission $3, XYL and kids under 16 free. Tailgating area $1 per 8' space, plus general admission. Talk-in: 147.225 or 146.52. Contact ***Dave WC3A, (717) 752–6851*** or ***Fred WB2YTA, (717) 356–7113.***

QUEENS, NY The Hall of Science Hamfest will be held at the New York Hall of Science parking lot at Flushing Meadow Park. Doors open at 9 AM. Set-up after 7:30 AM. Free parking. Donation $4. Sellers $6 per space. Talk-in: 147.195 and 445.175 repeaters. For info call (at night) ***Steve Greenbaum WB2KDG, (718) 898–5599*** or ***Arnie Schiffman WB2YXB, (718) 343–0172.***

CONTOOCOOK, NH The Contoocook Valley RC will sponsor their annual Ham Radio/Computer Electronics Tailgate Flea Market from 8 AM–3 PM. Directions: From Concord NH, take Interstate I-89 North 14 miles to Exit 7, east ½ mile (Rte. 103). Set-up admission $5, general admission $1. Talk-in: 146.895 and 146.94 repeaters; 52 simplex. Info: ***K1OPQ @ pkt WA1WOK-2,*** or ***(603) 746–5090.*** eves.

CANFIELD, OH The Twenty Over Nine RC will hold its Hamfest at the Mahoning County J.V.S. from 8 AM–3 PM. Admission $2. Tables available. Contact ***Don Stoddard, 42 S. Whitney, Youngstown OH 44509.***

CAMBRIDGE, MA TAILGATE Electronics/Computer/Amateur Radio FLEA MARKET Sunday Sep. 15th from 9 AM to 2 PM, Albany and Main St., Cambridge, MA. Admission $1.50. Free off-street parking. Sellers $5 in advance, $8 per space at the gate (includes 1 admission). Set-up at 7 AM. Call ***(617) 253–3776.*** Mail advance reservations before the 5th to ***W1GSL, PO Box 82 MIT BR., CAMBRIDGE MA 02139.*** Talk-in: 146.52 and 449.725/ 444.725–pl 2A–W1XM/R. Sponsored by the MIT Radio Society and the Harvard Wireless Club.

SEP 21

GILBERTSVILLE, KY The Marshall County ARA and Paducah ARA will hold its annual Kentucky Lake Hamfest at the Gilbertsville Elementary School Gymnasium beginning at 7 AM. VE Exams at 9 AM. Talk-in: 146.985 or 147.060 repeaters. Contact ***Kentucky Lake Hamfest, PO Box 534, Benton KY 42025.***

FORESTDALE, RI The Rhode Island Amateur FM Repeater Service, Inc. will hold their annual Fall Auction and Flea Market at VFW Post 6342 in Forestdale (No. Smithfield) starting at 8 AM. Auction from 11 AM–3 PM. Free admission. Flea Market spaces are $5 each. Talk-in: 146.76. Contact ***Rick Fairweather K1KYI, PO Box 591, Harrisville RI 02830*** or call ***(401) 567–0232*** between 7 and 8 PM.

SEP 21–22

GRAYSLAKE, IL The Chicago FM Club will sponsor RADIO EXPO '91 at the Lake County IL Fairgrounds from 8 AM–4 PM. The Flea Market will be open from 6 AM–6 PM. Free parking. Camping. FCC Exams both days. Advance ticket $5, $6 at the gate (good both days). Children under 12 free. Tables are $8 per 8' table per day. Electricity available for $4 per day. For info call ***(312) 262–6773.*** Talk-in on 146.16/.76 MHz repeater (CFMC). To make payments in advance, send payment with SASE to ***CFMC, PO Box 1532, Evanston IL 60204.***

NEW PHILADELPHIA, OH The Tusco ARC will sponsor a Computer/Hamfest in the Monroe Mall, 1260 Monroe St. N.W., Sat. from 10 AM–9 PM and Sun. from 12 PM–5 PM. Free admission. $10 per table. Talk-in: 146.13/.73.

YORK, PA York Hamfest and Computer Show. Inside dealer space. Large tailgating area. FCC Exams. Camping space available. Contact ***York Hamfest, PO Box 351, Dover PA 17315*** for info.

WALLA WALLA, WA The 45th Annual W7DP Hamfest, sponsored by The Walla Walla Valley ARC, will be held from 8 AM–5 PM (Sat. and Sun.) at the Ferndale School Gymnasium near Milton-Freewater OR. Registration/Admission is free. Swap tables are free (for radio gear only, please). License Exams Sun. afternoon. Please bring photo ID, a copy of your license and $5.25. Talk-in: 147.28/.88 repeater. Contact ***Ralph P. Taylor N7DWD, PO Box 321, Walla Walla WA 99362. (509) 525–3002.***

PEORIA, IL The Peoria Area ARC will hold its 32nd annual Hamfest, Peoria Superfest '91 and Computer Show at Exposition Gardens, Northmoor and University Streets. Gates open at 6 AM and doors to the vendor areas open at 8 AM. Free Parking. Wheelchair accessible. Admission $5, good for both days. Features: ARRL Illinois State Convention, VE Exams Sun. at 10 AM (walk-ins welcome). Talk-in: 146.76/.16 MHz. For tickets and info, send SASE with order to ***Peoria Area ARC, PO Box 3508, Peoria IL 61612-3508*** or phone the club answering machine, ***(309) 685–6698.***

VIRGINIA BEACH, VA Tidewater Radio Conventions, Inc. is pleased to announce the 16th annual Virginia Beach Hamfest/Computer Show which will be held at the Virginia Beach Pavilion and Convention Center, Sat. from 9 AM–5 PM, and Sun. from 9 AM–4 PM. Free parking. Radisson Hotel is next door. Gordon West WB6NOA will be the featured speaker. Exhibitors and dealers may contact ***Lewis Steingold W4BLO, (904) 486–3800*** for info and reservations. For tickets and general info contact ***Manny Steiner K4DOR, 3512 Olympia Lane, Virginia Beach VA 23452. (804) 340–6105.***

SEP 22

URBANA, OH The Champaign/Logan ARC Hamfest/Computer Show will be held at the Fairgrounds south of the square on US68. Advance tickets $8, $10 at the door. Set-up at 6 AM. Doors open to public from 7 AM–3 PM. Trunk sales after the tables are sold out. Motels nearby. Talk-in: 147.00+ W8EBG repeater or 147.51 simplex. Contact ***Hamfest Chairman Paul Amerine KC8NM, 168 E. State St., PO Box 185, West Mansfield OH 43358-0185. (513) 355–5352.***

OLD WESTBURY, NY The Long Island Mobile ARC will host a Hamfest at the New York Institute of Technology, Old Westbury Campus, from 9 AM–4 PM. Tickets $5 at the gate. Exhibitors $10 (no advance). Contact ***Neil Hartman WE2V, (516) 462–5549*** or ***Mark Nadel NK2T, (516) 796–2366.*** Talk-in: 146.25/.85.

DANBURY, CT The Candlewood ARA will sponsor a Flea Market at the Elk's Club, 346 Main St. from 8 AM–3 PM. table set-ups at 7 AM. Admission $4, kids under 12 free. Tables $8, tailgating $6 (includes 1 admission). For reservations: ***C.A.R.A., c/o Bob Elton, 60 Padanaram Rd., #18, Danbury CT 06810.*** For info call ***(203) 790–7987*** or ***(203) 426–1652.***

SEP 27–29

SAN JOSE, CA The 10th Annual ARRL Computer Networking Conference will be held at Radisson Airport. Contact ***Glenn Tenny AA6ER, Fantasia Systems, Inc., 2111 Ensenada Way, San Mateo CA 94403. Voice (415) 574–3420; Fax (415) 574–0546; UUCP/Internet: tenneywell.sf.ca.us; CompuServe: 70641,23.***

SEP 28

VANDERBILT, MI The Northern Michigan Chain of Clubs will sponsor its second annual Hamfest at Vanderbilt School (I-75 to exit 290 E), from 8 AM–2 PM. Set-up at 6 AM. Admission $3 in advance, $4 at the door. Dealer tables $5. Flea Market tables $4. For walk-in VE Exams, bring your original license and a photocopy. Talk-in on 147.120 repeater. Contact ***Bob George W8PIC, PO Box 173, Oden MI 49764-0173.*** or call ***Denny, (517) 732–9539*** or ***Tim, (517) 826–5549.***

WARSAW, IN The American Red Cross ARC of Warsaw IN will sponsor the First Ever ARC II Hamfest at the National Guard Armory located two miles north of Warsaw. Gates open at 7:30 AM sharp. Admission $3.50. Indoor tables $5. Outdoor spaces free with admission on a first come, first served basis. For reservations or tables call ***John Sparks, (219) 269–5187 (after 3 PM).*** For advance tickets, send check or MO to ***American Red Cross A.R.C., c/o John McClements WB9FIF, 113 15th St., Winona Lake IN 46590.*** Talk-in: 146.985, 442.550.

SEBASTOPOL, CA The 9th annual SCRA Ham Radio Flea Market and Auction will be held at the Holy Ghost Hall, 7960 Mill Station Rd., from 8 AM–2 PM. Free admission, free parking. Set-up starts at 7 AM. Advance tables $10, $12 at the door. Talk-in: 146.13/.73 Contact ***Sonoma County Radio Amateurs, PO Box 116, Santa Rosa CA 95402. (707) 523–1001 days; (707) 526–2198 eves.***

UPDATES

SEP 28–29

LOUISVILLE, KY The Greater Louisville Hamfest will be held at the Commonwealth Convention Center, downtown Louisville. Advance tickets $6 with SASE; $8 at the door. Commercial and Flea Market spaces available. Mail ticket requests to ***The Greater Louisville Hamfest Assn., PO Box 34444-S, Louisville KY 40232-4444.***

SEP 29

PASCO COUNTY, FL The Suncoast ARC will hold the First Pasco County FL Hamfest at the New Port Richey Rec. Center from 8:30 AM–3:30 PM. A W5YI testing session will be conducted. An ARRL awards manager will be present to verify QSL cards for awards. Admission is $3 at the door, children under 12 admitted free. Sellers $5, pre-registration requested. Tables are available for rent. Contact ***Suncoast ARC, PO Box 7373, Hudson FL 34676,*** or ***Ralph N4QIK, (813) 847–4043.***

YONKERS, NY Metro 70cm Networks' Giant Electronic Fleamarket will be held at Lincoln High School on Kneeland Ave. Free parking. No tailgating. 9 AM–3 PM rain or shine. VE Exams 10 AM–2 PM. Admission $4; kids under 12 free. Set-up at 7 AM. First table $15, $10 ea. additional table. All tables 30" x 5'; or bring your own table at $1.80 per foot, min. $10. Full payment is due with registration before Sep. 20th. No refunds unless notification of cancellation has been received 72 hours in advance. All tables $20 at the door–$2.50 per ft. Contact ***Otto Supliski WB2SLQ, 53 Hayward St., Yonkers NY 10704. (914) 969–1053.*** Talk-in: 440.425, 445.425T, PL 156.7HZ, 146.910R/146.310T, 223.760R/222.160T PL 74.4.

CLEVELAND, OH The Cleveland Hamfest/Computer Show will be held at the Cuyahoga County Fairgrounds in Berea, OH (a few miles south of Cleveland Hopkins Int'l. Airport) from 8 AM–4 PM. Set-up at 6 AM. Talk-in: 146.73/.13 from 6 AM–Noon. VE Exams walk-in at 2 PM. Contact ***Ed Stevens WB8ROK, 18607 Fairville Ave., Cleveland OH 44135-3915. (216) 267–5473.***

LONGMONT, CO The Boulder ARC will sponsor BARCFest '91 at the Boulder County Fairgrounds Exhibit Bldg., from 8 AM–2 PM. (Twin Peaks Shopping Mall is just across the street.) VE Exams. Admission $3 per person. Tables $10 each. Make checks out to ***Boulder ARC,*** with SASE to ***Kim Elmore N5OP, 1103 South Gay Dr., Longmont CO 80501.*** Or leave a message at ***(303) 530–2903.***

ADRIAN, MI The Adrian ARC will hold their 19th annual Hamfest/Computer Show at the Lenawee County Fairgrounds from 8 AM–2 PM. Advance tickets $3, $4 at the gate. Inside tables $6/8'; trunk sales $3/8'. VE Exams. Talk-in: 144.770/145.370 (input/output). Info and reservations from ***Dennis Boydston WE8Z, 2383 E. Clearview Dr., Adrian MI 49221. (517) 265–8054*** after 4 PM EDT.

SPRINGFIELD, IL The Sangamon Valley RC will hold their New Berlin Hamfest from 8 AM–1 PM at the Sangamon County Fairgrounds in New Berlin. VE Exams. Flea Market. Tickets $3. Indoor tables $10. Talk-in: 146.805 −.600. Contact ***SVRC, PO Box 8252, Springfield IL 62791. Don WD9EBK, (217) 789–4519.***

SPECIAL EVENT STATIONS

SEP

VERMONT Throughout the coming year Special Event Stations in Vermont will operate 25 kHz up from the bottom of the Novice and General band, to help celebrate Vermont's 200th Anniversary. RTTY/AMTOR/etc. will be in the digital sub-bands. For a special certificate send $1 and a SASE to ***Amateur Radio Bicentennial Project, PO Box 200, Graniteville VT 05654.*** Foreign stations send only SAE and IRC's to cover postage.

SEP 1

SCHAUMBURG, IL The Schaumburg ARC will operate WB9TXO 1500–2100 UTC, from their Demonstration Station at Schaumburg's Annual Septemberfest. Frequencies: 7.291, 14.291, 21.291, 28.391. For special certificate send QSL to ***SARC, PO Box 68251, Schaumburg IL 60168-0251.***

SEP 6–8

PUT-IN-BAY, OH Members of the Oliver Hazard Perry Expeditionary Force will operate KB8BN from Perry's Victory and International Peace Memorial, to commemorate the 178th anniversary of the Battle of Lake Erie. The celebration of Perry's victory, and continuing Canadian/American Friendship, will be marked by the return of the restored US Brig Niagara, Commodore Perry's relief Flagship. KB8BN will begin operations at 2100Z. Frequencies: 28.365, 21.365, 14.265, 3.965 MHz. For a commemorative certificate, please send a QSL and large 9X12 SASE to ***Commodore Don Wills, 30372 Bates Rd., Perrysburg OH 43551-3832, USA.***

SEP 9–14

ATLANTIC CITY, NJ Southern Counties ARA will operate K2BR, beginning at 9 AM EST, from the Miss America Pageant in Atlantic City. Atlantic City is located on Absecon Island, which is Iota: NA111. Frequencies: Phone–25 kHz inside lower General class band edge. CW–65 kHz inside lower General class band edge. Novice–28.100/.500 MHz. QSL with #10 SASE via ***SCARA, PO Box 121, Linwood NJ 08221.***

SEP 14

WARSAW, IN The American Red Cross will operate a Special Event Station from 7 AM–4 PM. Frequencies: 15 kHz up from the bottom of General and 28.450± 10 kHz. Send QSL card and SASE to ***KB9AVT Ron Effinger, Rt. 5, Lendonway Terr., Syracuse IN 46567.***

SEP 14–15

PINE GROVE, CA The Amador County ARC will sponsor Station W6PI as part of the Amador County Gold Country Jubilee from 1700Z–0500Z each day, with SSB on the first half hour and CW the second half hour. Frequencies will be in the lower 25 kHz of the General subbands and the Novice/Technician 10 meter subband. For a commemorative QSL, send your QSL and an SASE to ***ACARC, PO Box 1094, Pine Grove CA 95665.***

SEP 15

SAN JOSE, CA The West Valley ARA will operate Station W6PIY to commemorate the club's 35th Anniversary. W6PIY will be portable from a local park and can be worked on CW–14055, 21120, 28120; or SSB–14250, 21350, 28450, from 1600–2200 UTC. For commemorative certificate, send a SASE to ***W.V.A.R.A., PO Box 6544, San Jose CA 95150-6544.***

SEP 21–22

MONMOUTH COUNTY, NJ The Ocean-Monmouth ARC will operate KC2Q, from 1600Z Sep. 21st–1600Z Sep. 22nd, from the historical Twin Lights Lighthouse. This event commemorates the first commercial use of wireless transmission by Marconi in 1899 from this exact location. Frequencies: 3.970, 7.270, 14.270, 21.370, 28.470. 8½ x 11 certificate available via ***OMARC, PO Box 357, Bradley Beach NJ 07720.***

SEP 27–29

PEA PATCH IS., DE The Tristate IRC will operate KD3XN from historic Civil War, Fort Delaware, on 10, 12, 15, 17 and 20 meters. Operators will be N3EMY, N3IGK, N3ISR, and KD3XN. For QSL please send SASE to operator worked.

YORK, PA The Hilltop Transmitting Assn. will be operating KA3TFI or WF3T in celebration of the 88th year of Harley-Davidson Inc. Operation on CW and SSB, 80 thru 10 meters, from 1400Z–0400Z. Frequencies: Novice 10 meters and General subbands SSB and CW. The stations will operate from the test track behind Harley-Davidson's final assembly plant in York PA. For certificates send QSL and SASE to ***KA3TFI, RD #6 Box 119, Circle Dr., Red Lion PA 17356.***

KINGWOOD, WV Preston County amateur radio operators will operate WM8E from 1400Z Sep. 27th–0200Z Sep. 29th, in celebration of the 50th annual Preston County Buckwheat Festival. Modes will be phone or CW on 40, 20, 15 and 10 meters, approx. 25 kHz up from the bottom of General phone bands or Novice CW bands. For certificate, send QSL and SASE to ***John Wills KE8NO, 104 Swartz Rd., Kingwood WV 26537.***

SEP 28–29

BRANCHVILLE, SC The world's oldest railroad junction will host Station AD4U as the Edisto ARS celebrate their Second annual coverage of the RAYLRODE DAZE FESTIVUL. AD4U will operate 14.285, 21.375, and 28.400 MHz± and area 2m repeaters from 10 AM–10 PM EDST on Sat., and 1PM–6PM EDST Sun. For a distinctive 8½ x 11 certificate, send QSL and SASE to ***AD4U, PO Box 2045, Orangeburg SC 29115–2045.***

Allderdice Students Contacted the Atlantis

In Philip Chien's article, "The Flight of STS-37" in the June 1991 issue of *73*, the list of schools contacting the shuttle *Atlantis* was incomplete.

The students at Reizenstein Middle School in Pittsburgh joined the students at Allderdice High School in Squirrel Hill, Pennsylvania, to use the Allderdice High School ham station. Reizenstein Middle School was mentioned in the article, but Allderdice High School was not.

Operating with the callsign W3BMW belonging to Allderdice teacher Ed Karsin, students from both schools were able to experience the thrill of contacting the shuttle.

We apologize to Ed and the students of Allderdice High School for omitting them from the list of schools.

OMIK Inquiries

See the information on OMIK, submitted by Ocran M. Carr K9RGV, on page 8 in "QRX" of the June 1991 issue. If you would like to know more about OMIK, contact OMIK's secretary: Thomas A. Spight, P.O. Box 805, Racine WI 53403.

QRP Column Correction

In last month's "QRP" column (August 1991), there was an error in the PC board foil pattern and parts placement for the pulse charger circuit. The in and out pins of the optional LM317K device were reversed. Note, however, that the circuit will work if you use the LM317T device instead. Figures 1 and 2 show the correct foil pattern and parts layout.

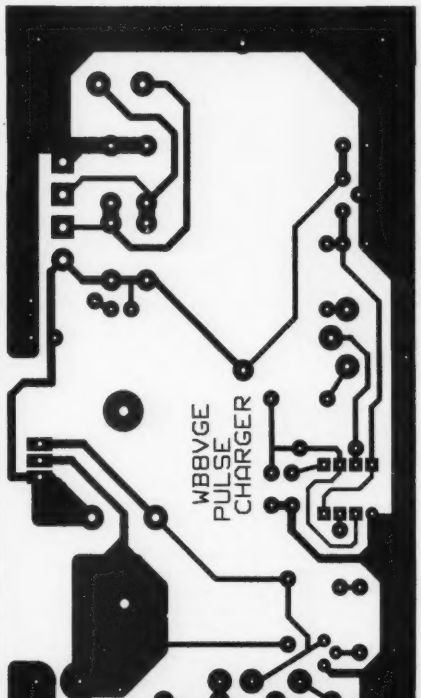

Figure 1. Corrected PC board foil pattern for the pulse charger (August "QRP" column).

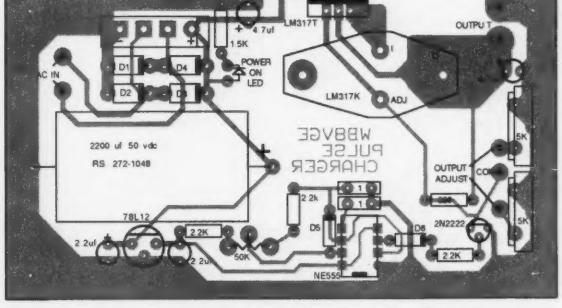

Figure 2. New parts placement for the pulse charger.

VK3 QSL Bureau Alive and Well

In the April 1991 "DX" column, a statement was made that the VK3 incoming QSL Bureau would no longer take cards. Apparently this message was the result of a prank (or worse). According to the Wireless Institute of Australia, the VK3 QSL bureau is alive and well and can accommodate all incoming QSLs destined for the area.

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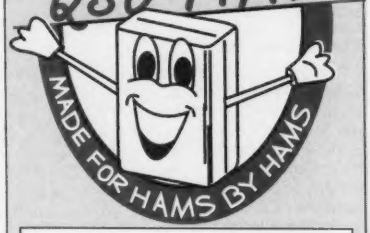

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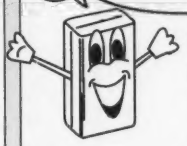

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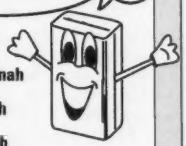

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Home-Brew Tuner for QRP

Antenna tuners are easy to build. But, I've always had the notion you could buy one cheaper than you could build one. Unless you have a very large junk box stocked with wide-spaced variable capacitors and roller inductors, you have to purchase all the parts new. Have you looked up the price of a roller inductor recently? Talk about the national debt!

Even though you can't really beat the roller inductor for getting the precise amount of inductance, they're hard to mount. They also require a logging scale of some sort so that you can re-tune to the same spot if you change bands and come back later.

Running QRP, we have the option of using a rotary switch to select the inductance as needed. To a point, RF breakdown of the components is not a factor at QRP power levels; the tapped coil is not as accurate as the roller inductor, but it will work just fine.

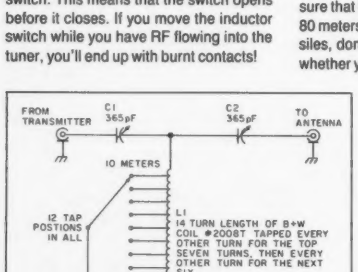
We'll need some type of chassis to house this project. To this day, I don't enjoy pounding holes in metal, let alone bending the stuff into a chassis. Radio Shack once again comes to the rescue with a project box, RS 270-274, for about ten bucks. A good value if you include all the suffering you'll save yourself by buying it. Don't use a plastic box.

The circuit is a classic antenna tuner. Nothing fancy. The fancy work will come in with mounting the parts. Some of the parts may be hard to find. This is not a jump-in-the-car-and-go-get'em project. However, I do have several sources for most of the parts.

Coil and Switch

The hardest part to come up with is the coil. I used B&W 2008T coil stock for the antenna tuner. The coil form is 14 inches long, of which you'll only need about 1-3/4 inches. Here is your chance to stock up the junk box or to make this a club project and use up the whole coil. Those of you who are stout of heart could wind your own, but the B&W is a lot easier!

Next on the shopping list is a switch to select the inductor's windings. Radio Shack sells a 12-position switch like the one we need, but it is a NON-shorting switch. This means that the switch opens before it closes. If you move the inductor switch while you have RF flowing into the tuner, you'll end up with burnt contacts!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14 TURN LENGTH OF B+W COIL #2008T TAPPED EVERY OTHER TURN FOR THE TOP SEVEN TURNS, THEN EVERY OTHER TURN FOR THE NEXT SIX
80 METERS

For QRP, a tapped coil antenna tuner will work fine.

A good switch to use (surplus might be a good place to start looking for this switch) is a Centralab CTS T201. It's an 11-position, make-before-break rotary switch.

Cap Details

Both 360 pF capacitors are standard broadcast type. These are easy to come by. The capacitors MUST be insulated from ground. This includes the capacitors' shafts as well. I used some 1/4-inch thick plastic that I found in the junk box. Two screws hold the capacitor to the plastic, and two more screws hold the plastic/capacitor combination to the chassis. Both capacitors are mounted in this fashion.

You might want to raise the height of the capacitors a bit. Too low and you'll have trouble getting the knobs on, too high and you'll have trouble getting the top of the chassis on. Plan ahead before you get the drill spinning!

Keeping the shaft above ground proved very interesting. I did have some old ceramic couplers lying about in the junk box. They proved invaluable. Lacking these, plastic couplers can be fashioned. Drill out a 1/4-inch hole from round, 3/4-inch thick plastic stock and add self-tapping screws, one for each shaft. The screw will hold the shaft to the coupler. The homemade coupler need be only 1 inch long. If you can't find 3/4-inch round plastic, try a maple dowel. Seal the wood after you're done, to keep moisture out.

You'll also need some 1/4-inch plastic or nylon. A good place to get this is the local hobby store. Steel would be all right, too, but plastic is easier to work with. If you really want to get fancy, a panel bushing would be grand! It gives the entire project a good solid feel when tuning the capacitors. If you have some old pots, these can be disassembled and used for panel bushings. The newer ones won't work. Remember when everyone laughed at you when you brought the dead DX-100 for ten bucks? Well, there has to be half a dozen panel bushing in one of those boat anchors. Who's laughing now?

Solid Connections

The most cumbersome work in building this project was attaching 12 wire jumpers from individual turns on the coil to terminals on the switch. Here's how I did it. Starting at the left end of the coil (the 10 meter end), tap every turn through the 7th turn, and then tap every other turn. Just be sure that the last tap is on the last turn, for 80 meters. Since we're not launching missiles, don't sit up at night worrying about whether you got the tap in exactly the right place or not.

You'll need some rather heavy wire to connect the two capacitors and the switched inductor. I used a small length of #12 house wire after removing the plastic insulation. Soldering should be done with a rather large soldering iron or gun. Use lots of heat to avoid cold solder joints. However, be careful not to overheat the B&W coil, as the plastic ribs will melt.

I used standard SO-239s for antenna connections. Don't cheat and use junk for connectors. Get the good ones with the Teflon™ centers and silver plating. Get the best you can afford. Nothing like trying to save a buck, only to have it come back and bite you.

Even though there are only a handful of connections, be sure they are good and solid. To ensure a good ground, scrape away any paint on the chassis when you mount the SO-239s.

The Least for the Most

There is little to adjust or tune. If you assembled the tuner following the schematic, and insulated the two caps, it should fire right up. Remember, use the least amount of inductance for the best power transfer.

To use the antenna tuner, connect the transceiver and the antenna to their proper connections. You'll need an SWR bridge if your rig does not already have one built in. Set both capacitors at midway, then adjust the inductance control for the highest noise level in the receiver. Apply some RF, and watch the SWR meter. While watching the meter, adjust both capacitors, one at a time.

At some point the SWR will dip down. Add more RF if necessary to ensure an accurate SWR reading. Adjust both capacitors for lowest SWR. If you can't get a match, move the inductor switch up or down one position and try the capacitors again. At some point, you'll find the correct combination and get an SWR of 1:1. If you're not planning on running QRP, remember that the power level is determined by the spacing of the capacitors, the switch, and of course, the coil. With stock parts, don't use more than 200 watts of RF into the tuner.

This tuner is for use with antennas fed by coaxial cable. It won't work with random wire or 300 ohm twin-lead. A tuner does not change the SWR of the antenna; it merely provides the correct load for your transmitter. In my case, it allows me to operate SSB on a dipole cut for CW. The SWR is too high in the phone segment of the band on my 20 meter dipole. The tuner is not a magic cure for the wrong antenna!

That's all there is to this project. Most of your time will be spent trying to get the parts. Antenna tuners are not easy to build without the correct parts. As I mentioned early on, I have a source of parts for this project, several sources to be exact. (See the list of parts suppliers.) Besides the hamfest and your friend's junk box, try Surplus Sales of Nebraska. They have the capacitors as well as the B&W coil. Also try Radio Kit.

Here's an unexpected source of parts for the tuner: Ten-Tec. Yup! They sell the tapped inductor from their smaller antenna tuner. This part has more taps than specified above for the tuner, but it works great! They also have a good supply of variable capacitors and insulated shaft couplings. You might even get some panel bushings as well.

Enjoy your project. Next month we'll take a close look at portable packet operation, QRP style. 73

Parts Suppliers

Ocean State Electronics
P.O. Box 1458
Westerly RI 02891
Tel. (800) 866–6626 (orders);
(401) 596–3080; Fax: (401) 596–3590

Minimum $5, S&H $4, free catalog. Wide array of RF parts, especially air variables and B&W coils, plus kits for most *QST* projects since 1976. "Non-cataloged items gladly ordered." Fast shipping.

Radiokit
P.O.Box 973
169 Jeremy Hill Rd.
Pelham NH 03076
Tel. (603) 635–2235

No minimum ($3 service charge if under $20), many kits, lots of J.W. Miller chokes and coils, B&W coils, RF switches, Millen variable capacitors, lots of parts in general. Send $1 for their catalog.

BCD Electro
P.O. Box 450207
Garland TX 75045-0207
Tel. (214) 343–1770

$1 for 1-year subscription to catalogs; no minimum; $0.95 for under $30, $2.90 shipping. Surplus electronics, pretty random looking assortment.

Surplus Sales of Nebraska
1315 Jones Street
Omaha NE 68102
Tel. (402) 346–4750

New and surplus radio electronics. Wide selection; lots of Collins stuff.

KA7QJY Components
Box 7970
Jackson WY 83001
Tel. (307) 739–1634 evenings

Send a business-size SASE for a current list of parts. RF parts, including vernier drives and air variables. $2.75 shipping, no minimum.

Oak Hills Research
20879 Madison St.
Big Rapids MI 49307
Tel. (616) 796–0920

This is Doug DeMaw's old outfit, now run by Dick Witzke KE8KL. Dick has also purchased Small Parts Center's line of kits and parts. Catalog is $1.00; product line has been greatly expanded with new kits, components, antennas, and many hard-to-find items, including new USA manufactured air variable capacitors, vernier drives, and roller inductors. **Everything** for the diehard home-brewer/QRPer.

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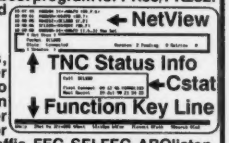

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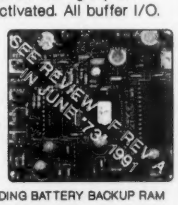

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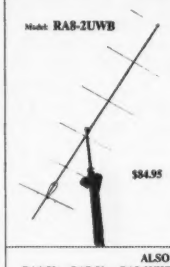

ELECTRICAL SPECIFICATIONS:

Gain	11.2 dBd
E-Plane beamwidth	40 deg
H-Plane beamwidth	45 deg
Bandwidth	> 4 MHz
Sidelobe attenuation	
1st E-Plane	-20 dB
1st H-Plane	-14.5 dB
SWR	<1.5:1 144 to 148 MHz
Maximum power	400 Watts
F/B ratio	22 dB
Impedance	50 ohm

MECHANICAL SPECIFICATIONS:

Length	11 ft. 9 in
Boom	1"OD 6061 T-6 AL
Mast	up to 1-1/2" diameter
Wind survival	90+MPH
Element Insulators	Black Delrin
All Stainless Steel Element Hardware	
Coax connector	N-type
Weight	3.5 lb.

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CIRCLE 193 ON READER SERVICE CARD

Arnie Johnson N1BAC
103 Old Homestead Hwy.
N. Swanzey NH 03431

Notes from FN42

I am finding it very interesting in this job to see the increased communications coming out of countries that in the past have been closed and controlled. It does my heart good to see these things. Even though I have not had as much time to get on HF as I would like, I hope that others have been taking advantage of these changes.

Solar flares last June made amateur communications difficult, though not impossible. My HF packet traffic back and forth to Ron Gang 4X1MK in Israel seems to make it fine. I put my message on a local packet board here in New Hampshire, and usually within a day it arrives at a packet board near Ron. And most of the DX nets are still prospering.

Before we get to the news from around the world, I would like to make a correction to the July 1991 "Notes from FN42" in which I said that we would find out what Box 88, Moscow, was like thanks to Ron Gang 4X1MK. Ron was just the messenger; Oded Schremer 4X4SO provided the information. Thanks, Oded.—Arnie, N1BAC.

Roundup

Japan From *The JARL News:* From April 6–13, an Amateur Radio Administration Course was held at the Iikura Annex of the Ministry of Posts and Telecommunications, Tokyo, under the combined auspices of the International Telecommunication Union (ITU), the Japanese Ministry of Posts and Telecommunications, and JARL; and also with the cooperation of the International Amateur Radio Union (IARU) and the Telecommunication Advancement Foundation in Japan (TAF).

The main purpose of the international seminar was to contribute to the development of telecommunications in each country through the promotion of orderly development of amateur radio. The last time such a seminar was held in Japan was four and a half years ago. This year, 17 government officials from 17 different countries of the Asian and Pacific Regions participated, all of them representatives of countries where amateur radio operation has only just started or is not sufficiently developed.

Countries participating in the seminar were India, Indonesia, Kiribati, Singapore, Sri Lanka, Solomon Islands, Thailand, China, Tonga, Western Samoa, Nepal, Pakistan, Fiji, Philippines, Bhutan, Vietnam, and Malaysia.

U.S.S.R. From Alex Barinov UA3DCZ: "Within the frames of preparation and carrying out the Orthodox-Christian Cultural Program '600 Years of Saint Sergius's of Radonezh Death' which is conducted in 1991–1992 by the Soviet Cultural Fund, the Saint Sergius of Radonezh Brotherhood will operate from October 5–13, 1991 under the special callsign R3DSR. It will be a radio expedition-marathon devoted to the 650 years of the Saint Trinity-Sergius Monastery that was founded by Sergius of Radonezh, the great churchman and statesman of ancient Russia.

"The radio expedition-marathon is organized by the youthful sports and technical club 'Energy' from Zagorsk, the group of radio amateurs 'Kivach' from Petrozavodsk, the group 'The Union' from Orsk, and the club of collective radio stations from Omsk.

"We will be listening for all amateurs on all bands, both HF and VHF. Radio amateurs and SWLs who establish the most number of contacts and observations on different bands, and radio amateurs younger than 18 years of age, will be awarded special prizes of the Saint Sergius of Radonezh Brotherhood in Zagorsk.

"Send the account with the information about the owner of the radio station not later than November 1, 1991, your QSL for R3DSR, and your suggestions to: Alex Barinov UA3DCZ, Box 4, Zagorsk, 141300, Russia, USSR.

"By establishing radio communications with R3DSR and the radio amateurs of the town of Zagorsk, you can fulfill the requirements for winning the pendant 'Sergius of Radonezh,' the award for 650 Years of the Saint Trinity-Sergius Monastery."

From Igor V. Suprunov UA9MFW: "The West Siberia Collector's Club (WSCC) is for everybody who is collecting anything." Igor UA9MFW is president/founder of the WSCC (and an aircraft plastic model kits fan). Using a home-brew computer and simple printer, Igor and his wife (UA9MLW, a model car collector), and their friends, publish a bi-monthly bulletin, "WSCC Round Table."

You can receive the "WSCC Guide" (for radio amateurs), including membership rules, awards program, and members list with their addresses and collecting interests by sending an SASE with 4 IRCs or 2 green stamps to Igor V. Suprunov, P.O. Box 3360, Omsk, 644020, USSR. Please seal your envelopes carefully. *[Igor sent a copy of the rules for 14 awards given by WSCC. It is too lengthy to include here, but it will be put on the 73BBS (603-525-4438, 300, 1200, or 2400 baud, 8-N-1). The information also lists the callsigns of 40 members of WSCC.—Arnie]*

Photo B. QSL card of UA3DCZ showing the Saint Trinity-Sergius Monastery.

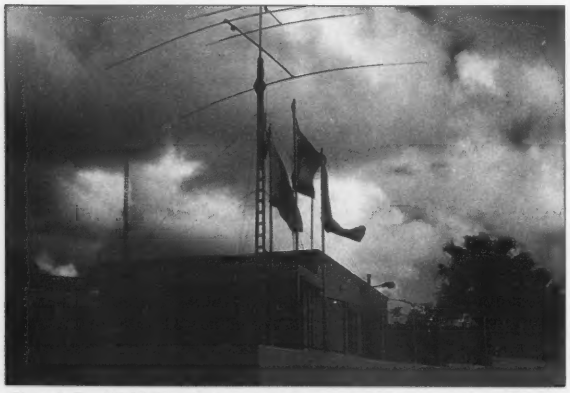
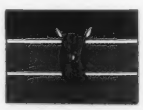


Photo A. The URE/URL clubhouse and antennas in Las Palmas, Canary Islands.



KENYA

Rod Hallen 5Z4BH
AMEMBASSY Box 55A
APO New York 09675

After four years in Nairobi I have received an assignment to Karachi, Pakistan. I hope to receive a callsign there, but there is no guarantee. Callsigns are hard to acquire. I am to leave here sometime late next year and will be in AP2 country for two years.

The Radio Society of Kenya (RSK) has been working on reciprocal licensing agreements for the past year. The U.S. agreement is in the final stages; agreements for Germany and the U.K. are also in progress. All the details are not in yet, but I will pass them on when they become available.

The RSK is planning a Field Day 13–14 July, so look for us. The callsign will be 5Z4RS/A. We are also considering a QSO Party sometime in the fall. One of the purposes of these activities is to promote the Kenyan Award. This attractive award is available to any amateur operator who works five 5Z4 stations who are members of the RSK. The club station, 5Z4RS, counts as two contacts. A certified list of contacts is all that is required, no QSLs.

The award costs $8 or 15 IRCs. The application with certified log data should be sent to the Awards Manager, Radio Society of Kenya, Box 45681, Nairobi, Kenya. Registered mail is suggested but not required.

An interesting sidelight to this award is the fact that most of Kenya's DXers are in regular communications with each other via 2 meter repeater or simplex. Whenever one of us contacts a station that is interested in the award, it is usually possible to get enough members on frequency to fulfill the requirements all at once. By the way, there is usually one or more 5Z4s in contact with John W4FRU on any Tuesday at 1900Z on 21.220 MHz.

The RSK has also recently become very interested in satellite communications. Although we somehow missed the shuttle with its all-ham crew, we have been making up for it by working the Russians. Six of us have made contacts with U2MIR, U5MIR, or RS-11. I talked to Serge U5MIR on June 4, and we were able to have a QSO that lasted about four minutes. On a direct overhead pass he should be good for 10–12 minutes. He says he will be up there until October!! All of this with a 20 watt, 2 meter mobile with a ground plane antenna. *[But OH what a tall tower for that ground plane!—Arnie]*

Many of us have computers and satellite tracking software, so we always know when and where to look. We also have two members with fully functional OSCAR 10/13 stations.

REPUBLIC OF KOREA

Byong-joo Cho HL5AP
PO Box 4, Haeundae
Pusan, 612-600
Korea (South)

The Korean Amateur Radio League's (KARL) three portable stations: HL8A, HL8N, and HL8V, have used special calls during the past CQ Worldwide Contest operating from 78-1, Non Hyun Dong, Kang Nam-Ku, Seoul, Korea. These special callsigns were requested by KARL and the Ministry of Communication issued them for use during the International DX Contest.

Hereafter, KARL shall use D73A, D73DX, and D73CW in every international contest. HL8A = D73A; HL8N = D73DX; and HL8V = D73CW.

There will be three amateur examinations given this year. There are four different class licenses: 1st Class, 2nd Class, 3rd Class CW, and 3rd Class Phone. There will be examinations at eight different locations. The summary as of 15 May is: 2971 examined and 2224 passed for a 75% pass average. *[The most popular appears to be the 3rd Class Phone with 2773/2086.—Arnie]*

SAUDI ARABIA

Charles Martin
PO Box 2830
Dammam 31461
Saudi Arabia

Salaam Aleikum! I have arrived in Saudi Arabia and hope to be able to report on some of the happenings here and in the surrounding area. If there are any hams in the country or nearby area who have information for inclusion in "73 International," I would appreciate it if you would send it to me. 73.

Say you saw it in 73!

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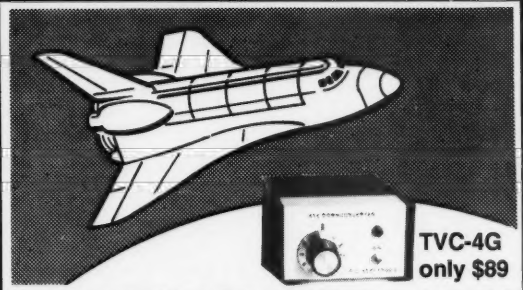

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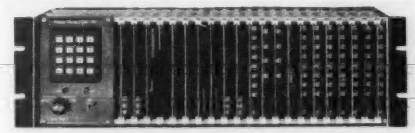

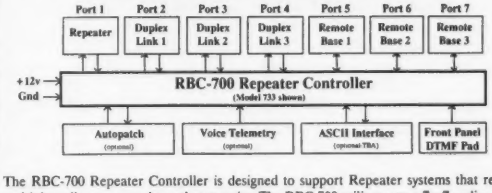

The RBC-700 Repeater Controller is designed to support Repeater systems that require multiple radios connected together at a site. The RBC-700 utilizes a true 7 x 7 audio matrix switch which allows several conversations between ports at the same time. In the illustration above the 733 model is supporting a Repeater, 3 Duplexed Links to different sites, and 3 Remote Bases. Using simple commands, a user could tie the Repeater and a Remote Base to one Link, while the other Links are communicating through your site, holding separate conversations. Or, connect all of the ports together - like a big party line !!

Several models are available and are software configurable to support up to 3 Repeaters, 5 Duplexed Links, and 4 Remote Bases. A group or club can start with the basics and **expand** their controller anytime by simply adding boards and software. Free software upgrades for one year after delivery. Finally, a real controller for the Linked system operator !

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CIRCLE 264 ON READER SERVICE CARD

HAMS WITH CLASS

Carole Perry WB2MGP
P.O. Box 131646
Staten Island NY 10313-0006

Men in Blue with Rigs

Several years ago I had the pleasure of meeting Jeff Savasta KB4JKL at the Boxboro Ham Radio Convention in Massachussetts. Jeff is a police officer with the Suffolk County Police Department in Long Island, New York. He was intrigued with the stories I told him about using amateur radio as a motivational tool for youngsters in a classroom. Police personnel have always been very supportive of my program. They are in a position to understand how important it is to interest young adults in worthwhile activities.

I really believe that a major cause of teenagers getting into trouble today is that they don't have the skills necessary to pursue interests that are challenging to them. The police officers in our area know that the children who are involved with the ham radio activities at our school have always been an asset to the community. They participate in many neighborhood events, and are among the first to volunteer when communications are needed.

One of the trips I take my ham radio classes on is to the New York City Police Academy. The communications network they use is very impressive to the children, and helps them understand the importance of clear and succinct messages in times of emergencies. It seemed perfectly natural, therefore, to invite Jeff to speak with the children at my school. I'm always on the lookout for hams with interesting backgrounds to be guest speakers for my classes at Intermediate School 72 in Staten Island, New York. As an instructor, I know how important it is to have not only an interesting person, but also a person who can convey enthusiasm and speak appropriately to the age level of the audience.

The kids were immediately attracted to his uniform and all the "goodies" he wore on his belt. If you invite police officers to visit your classroom, try to persuade them to appear in uniform. Children react well to that. My radio classes were fascinated with his stories about the importance of radio communications in his line of work. He also came prepared with a video that showed how an officer was killed because someone was fooling around and jamming the police frequency. The fact that Jeff is a ham radio operator himself gave special credence to his presentation about how to phone in an emergency. The children felt really special when he told them that the police are especially responsive to calls that come in from hams because they know that hams tend to be responsible and reliable in reporting accidents or other kinds of emergencies that require police intervention.

Jeff's visit to my school was only the beginning of a wonderful ongoing relationship with the children in the radio program. He was soon invited back and made another excellent presentation. The great goodwill a policeman visiting the classroom can generate should not be overlooked. It is extremely important for today's youth to have respect for the fine police officers who risk their lives every day for all of us. Everyone benefited from the contact.

I was especially pleased when Jeff told me he was involved in starting up a police amateur radio club. I hope the following account which he wrote for me will serve to inspire as well as to educate others who are thinking of starting a similar group.

Jeff Savasta KB4JKL Speaks

When I decided to undertake the starting of the Police Amateur Radio Club, I didn't realize what a major task this would be. If this club were being formed by people who work a nine-to-five day, it would probably have been easier. When members work different shifts, it's more difficult to get together.

The Suffolk County Police Department is a major metropolitan police department in a tri-state area. With 2500 sworn personnel and numerous civilian employees, there is a fair population of hams within the structure. Years back, there was an attempt to form an amateur radio club, but it never made it off the organizational level. I wanted to make sure that we would be successful.

At first it was a lonely endeavor. The questions that went through my mind were never-ending. There was a lot of doubt and anxiety about laying the cornerstone of this venture. "Where or how do I start?" I asked myself often. "And when I do, what type of response will I get?"

Then, one day in November 1989, as I walked into my precinct to report for work, I noticed an individual speaking into a microphone in a foreign vehicle next to the detective squad entrance. Curious, I got closer. As I neared the vehicle, I saw a 140–150 MHz VHF antenna on its roof. The individual inside the vehicle was talking on a 2 meter transceiver.

It felt good to see another ham inside the police complex, and it felt even better to realize that he was another cop. That was the first time that I met Detective Doug Lotten N2JHO of the arson squad. I introduced myself, and an immediate bond took place, one which always happens when two hams get within 50 feet of each other. I discussed my idea of a police amateur radio club with him, and he thought it was a great idea. It was comforting to get the perspective of another amateur radio operator who is also a professional peer. We went through the ideas we both had about getting things started.

The first thing I thought we should do was get the idea reviewed and approved by the upper bureaucracy of the department. I composed an internal correspondence in February 1990, and we began the waiting process that so often occurs in large organizations. Finally, in June 1990, after being reviewed also by the department's legal bureau, it was approved by the Police Commissioner.

The perfect way to reach out to our peers was through the departmental newspaper. We wrote an article about the club and got responses. Then we put together a club constitution which took us approximately two weeks to complete. I established a preliminary list of five members and applied to the ARRL for club affiliation. We were approved, and became an affiliated organization in November 1990.

I then decided to put out a makeshift newsletter for the amateurs and nonamateurs Doug and I had talked with in the department. We were surprised at how fast word-of-mouth had spread the club idea. I am a firm believer that hams find other hams, as we are definitely a community within communities, not only in the police structure, but in everyday public life.

In January we had our first meeting. It was plain that because of our different schedules, we wouldn't be able to all meet at the same time. We did have enough members present to carry out club business and hold elections. I was elected president; Doug, vice president; Roy LoBocchiaro KB2KOP, treasurer; and John Isbell KE2TC, secretary. John also took charge of the monthly newsletter and the logo on the letterheads.

We've sparked the interest of the nonamateurs in our department, and are becoming their elmers. We've also received favorable response from the non-police amateur community. Many local clubs have offered their assistance and use of club repeaters. We have been very pleased by this; I don't think many amateurs here in the Northeast are used to seeing the police involved in amateur radio. According to club Secretary John KE2TC, police involvement in amateur radio is more common in other parts of the country, such as the Midwest.

On a personal note, I've been to the class of Carole Perry WB2MGP at I.S. 72 in Staten Island, New York, to speak to the students about amateur radio, and on how police radio operation is similar. Most of the children in the class are intrigued and impressed by the police, as they are at a very impressionable age, and I feel that I should be the best ambassador I can be for amateur radio. Many students will remember their experience, and walk away feeling positive about themselves and amateur radio. I feel that we should all be the best ambassadors of amateur radio that we can be, both in the police and non-police sectors, as amateur radio has given us so much enjoyment and service.

Our club hopes to benefit its members and serve the public, goals all amateur clubs strive to achieve. Though amateur radio operators may come from different walks of life, we are all bound together by a common bond.

If any of you would like to write me or the club with questions and comments, address your letter to: S.P.A.R.C., %Suffolk County Police Dept., 30 Yaphank Ave., Yaphank NY 11980. *[Please also enclose an SASE.—Eds.]* 73

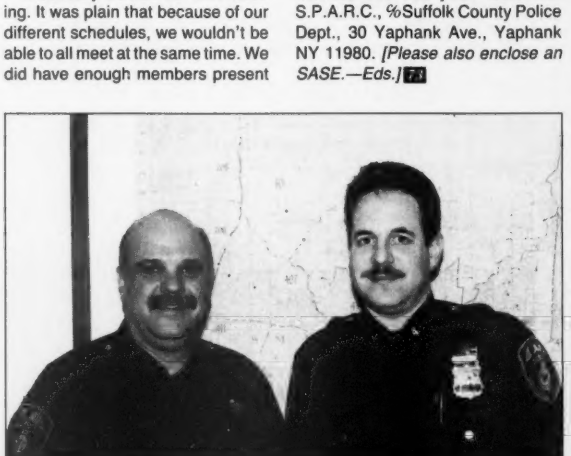


Photo A. Left to right: Detective Douglas Lotten N2JHO, Arson Squad, and Officer Jeffrey Savasta KB4JKL. A fortuitous meeting leads to a new ham club.

Never Say Die

Continued from page 4

the regular meetings? License classes? Code classes? By the way, I'm getting piles of letters from new no-coders and virtually every one is enthusiastic about learning the code to get a General ticket. I haven't seen any FCC figures yet showing the increase in hams due to the no-code ticket, but just judging from my mail, it's gotta be encouraging.

I'm hearing from more and more clubs who have been running license classes and graduating new Novices and Techs. My answer to each such letter: Prove it! Send me some pictures to print in *73* and *Radio Fun*.

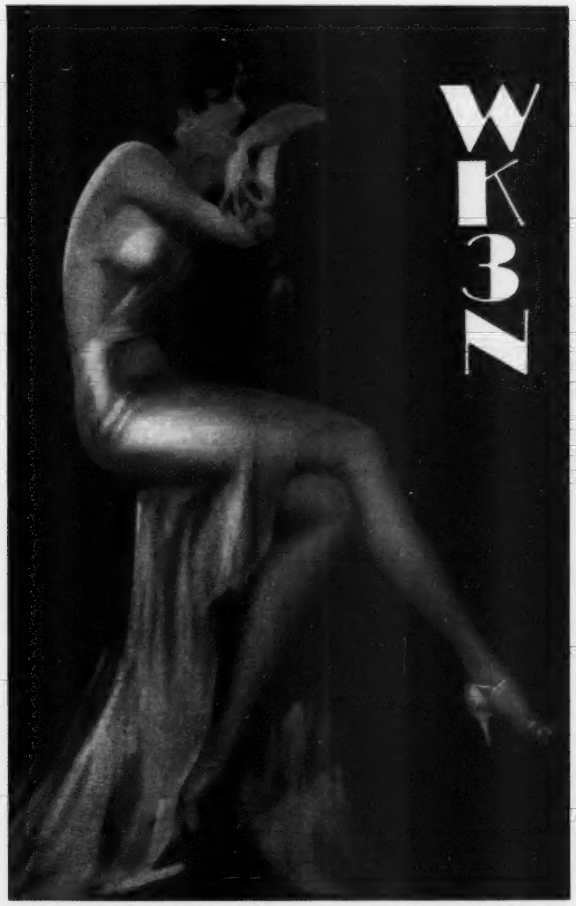
You want to find some interesting speakers for your club meetings. Maybe you can get a chap like our editor Bill Brown, who's sending ATV cameras up in balloons, to explain this weird hobby. . . and how much fun it is. You must have several packeteers who can put on a show and tell. You may even have some working on higher speed packet.

Once you've worn out your built-in talent, you'll want to look for some nearby ham manufacturers or dealers to invite. Ask them to explain why they are in the ham business, which has got to be one of the most frustrating industries in the world. Just get them talking about some of the hams they've had to deal with and you'll be in stitches. Hams, with probably only two exceptions. . . you and me. . . are crazy as bedbugs.

You know, they just don't have bedbugs like they used to. I've only run into 'em once in my life. . . it was a nice hotel, too. But hoo, what a night I had! It was the Australia Hotel in Melbourne. I couldn't see the little buggers, but they sure could bite. Considering some of the hotels I've visited on my travels, I'm lucky.

You can get ham industry people in to talk if you just ask 'em. Sure, you should buy them a dinner with two or three club officers, but that isn't much of a tab. If they have to come in from a distance you might cover their traveling expenses.

Heck, if I'm in your area I'll be glad to stop by and tell you all how rotten you are. I get to music and audio in-



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dustry meetings in Los Angeles, New Orleans, Chicago, Las Vegas, Nashville, Sedalia, San Francisco, Fresno, Cannes and a few other places, so we might be able to coordinate. Save the doughnuts and coffee until after the main speaker so half the club won't be dozing off on stomachs busy converting all those empty calories into fat to hang even further over already-grotesque beer bellies.

I'll be reading your club newsletters to see if any of my advice gets heeded or if you continue to crank out the same old pap every month. I want to start reading about how much fun the last meeting was and what exciting things you have coming up at the next meeting. I want to see the club business handled and reported in the newsletter so it won't make meetings boring. I want to start seeing pictures of your new licensees, your active club members, stories about how your CB search team has found a bunch of young new CBers and gotten them into your club license classes. I want to read about your TVI/interference committee and their successes. I want to read about hidden transmitter hunts. I want to see some SSTV pictures from rare DX. I want to read about any interesting adventures your members have. Have any gone on a DXpedition? Why not? The Atlanta club mounted a great DXpedition to Navassa a few years back. We've got a bunch of fairly rare spots in the Caribbean that are easy to get to and need activation, so what's holding you?

I want to read in your newsletter about your club's team work on cleaning up our bands. Stop griping and do something about it. If you want me to help, send me information on your worst local offenders and some tapes of the messes they're making. Let's expose these cockroaches to the light.

I suppose it's too much to hope for your club to run a member for the League director for your division? You've been re-electing the same old fogies (and crooks, in one case I could mention from bitter and expensive personal experience) every two years. Maybe it's time to make a change? Even the Russians are beginning to change, so why not you?

Is there a local school your club can adopt? Almost any school will be delighted to have your club work with them to interest their kids in amateur radio. They'll love to have your members come in and talk with the kids. I'll bet you can dig up an old rig to help them start their own radio club. Maybe not. I asked for some help in getting some gear for the nearby Crotched Mountain Foundation Rehabilitation Center Radio Club and got nary one response. The Center is a place where handicapped children are helped to cope with their problems. If you won't help handicapped children with an old rig you aren't using any more, we're talking hard-core ambivalence. So let's see you let loose a little and get some gear into your local schools. I want to read about it in your club newsletters. Better highlight it for me, so I won't miss it.

How many old HTs do you have kicking around? All they need are some new batteries and a pair of crystals for the local repeater and some kid could be in touch with the world from his wheelchair. The kids are eating up the license classes, but they need equipment. The Center is high up on a mountain, so their HTs will work out fine.

Sanger Green with Amelia Earhart in 1931.

The Fogies

It's been a while since I put some ham legends to rest. For instance, there's this legend about how the hams of yore were great builders and technical experts. What a bunch of baloney. Being a certified fogy myself, I was there and I can report what I found.

I grew up as a ham in Brooklyn (NY). I kept a map of Brooklyn with every active ham marked on it. I listened to every ham band and kept tabs. Then I'd put on my roller skates and go visit them. I don't think there was an active ham in the area I didn't visit.

Since there were virtually no commercially-made ham transmitters in those days (the late '30s), everyone had to build their own rig. This was simplified by articles in *Radio*, the main builder's magazine . . . and to a much lesser extent, *QST*. I built almost everything of mine from *Radio*.

But building a rig from an article and understanding what's going on are two different things. In all my travels I found just one ham who'd built his own receiver. And I found one ham who knew how radios worked. Cy. He was kept busy by everyone else, getting their rigs to work for them. Cy's main piece of test equipment was a neon lamp.

Oh, I read the technical articles. I read *QST* and the two handbooks (the best by far was by Jones W6AJF), but I still only had a hazy idea of how radio really worked. I was fortunate, in a way, that WWII came along in late 1941. The downside was that amateur radio got shut down instantly. The bright side was that I chose to go into the Navy (in 1942) and went through their electronics school. It was superb. Not even four years of electronics in college would have given me 10% of what I learned in nine months at the Bliss Electrical School in Tacoma Park (MD) and the Radio Materiel School on Treasure Island.

When I went aboard the Drum (SS-228) in 1943 I knew every aspect of the radar, sonar, and radio equipment and could fix anything.

Being thrown off the air by WWII had one additional benefit. My favorite radio supply house, Lafayette Radio, ran a special on classical music records . . . a close-out when Royale Records went out of business. I loaded up with one of every title. This got me even more solidly into classical music appreciation and hi-fi, standing me in good stead as a speaker manufacturer in the '50s and as the editor of a music magazine now.

Well, I've been over all that many times, so I won't elaborate. My point is that the hams of 60 years ago were not much different from those of today. They didn't know much more about the rigs they were using. They had only an inkling as to what was in their receivers. They did as foolish antenna experiments as we see today.

Once I got into ham publishing I found that 99% of the hams are ragchewers. It's the other 1% who are the technicians and the pioneers. It's this little group of fanatics that has done the inventing and paid the tab for the rest of us. As a ham publisher and editor for 40 years, I've had the privilege of knowing most of these movers.

So don't let old-timers sell you any bill of goods about the "real" hams of yore. They were no more real than those we have today. Also, if you find yourself getting upset over the idiots on 14.313, just do a little homework in the *QST*s of the late '20s and early '30s and read "The Old Man" (Hiram Percy maxim W1AW) and his endless tirades about rotten QRM. Nothing has changed. The hobby is just as lousy . . . and fantastic . . . as it's always been.

Amelia? Again?

Will someone please tell people to stop trying to find Amelia Earhart's plane? A few weeks ago they replayed the "Unsolved Mysteries" TV program about her and now I read there's a hunt on to find her plane. Sigh. Yes, I know the Navy hates to admit Amelia was on a mission for the Navy when she was lost. And the Japanese hate even more to admit that they executed her as a spy.

If you'll read Fred Goerner's book, *The Search for Amelia Earhart* (Dell #7699, 1967), you'll get the true story. It took Fred several years of hard work to find out what I serendipitously knew. I've read several books about her disappearance, but none, except Fred's, came even close to what actually happened.

So how come ol' Doc Green knows so much about this? Waaal, first of all my father was a pioneer in the airline business. He started out as an Army pilot in 1921, went on to barnstorm, designed and built the Philadelphia airport, and then became passenger manager for Luddington Airlines—one of the first commercial carriers, which was owned by Tommy Luddington and Amelia Earhart. In fact, the airline even used her personal Lockheed Vega when they needed it. She kept her plane at my dad's airport, so I knew it well. This was also why I happened to be in the right place at the right time to be a passenger on the first commercial airline flight in America. I remember getting up in grade school assembly and telling the whole school about it.

Amelia and my dad were good friends and occasionally flew together around 1930. I have pictures of them together.

My father left Luddington to start a new airline between New York and Boston. It would use flying boats so it could operate directly from downtown New York to downtown Boston, thus avoiding the trip to the airports. The main investors were other airlines, which wanted to handle Boston-bound travelers.

In early 1937 Bob Wemple, a longtime friend of dad's, told us about the work he was doing on Amelia's plane. He explained that she was going on a mission for the Navy. Her goal would be to overfly the highly secret Japanese naval base at Truk and take aerial pictures so the Navy could see what was going on. The whole reason for her flight around the world was to get this badly-needed intelligence.

Bob had installed a much more powerful engine and extra wing tanks so Amelia, with Fred Noonan as her navigator, would be able to make the flight from Lae, New Guinea, over Truk, and on to Howland Island in the same time as she normally would have made it direct to Howland. The higher speed would also enable her to outrun any Japanese fighters they might send up. The problem was she missed Howland.

Now cut from 1937 to 1944. I'm at a submarine rest camp in the Marshall Islands for a few days while the Drum was being refitted by the submarine tender Bushnell. In between endless games of Monopoly, some legendary poker games, loafing on some of the most beautiful beaches in the world, and skin diving in the fantastic lagoon, we managed to talk with some natives who had a fascinating story, about a plane crashing seven years previously, the woman (uninjured) and man (injured) who survived. . .the Japanese taking them and their plane to Saipan. Hmmm, so that's what happened to Amelia!

A few months later, when we stopped off at Saipan on our way to Guam for another refit, the natives confirmed that Amelia and Fred had been there. Fred had died and Amelia was executed. When the Americans arrived they exhumed the bodies and burned their plane.

Since I'd heard all about this, it never crossed my mind that there was any big mystery about what had happened to Amelia and Fred. When Goerner's book was published in 1967, I wrote to congratulate him on uncovering the story. I was surprised that he had so much trouble finding out what happened, but with both our Navy and the Japanese doing their best to cover up everything, his story was more about his adventures in fighting the cover-up than what happened to Amelia and Fred.

I remember Bob Wemple well. He visited us on and off for about ten years. He was a short sandy-haired chap with a serious limp and the damnedest waxed mustache I'd ever seen. He was a crack mechanic. He married Miss Philadelphia while flying over that city around 1930.

When the "Unsolved Mysteries" segment about Amelia was aired last year I wrote and explained what really happened. Their report came close, but they had her crashing on Saipan in the Mariannas, instead of the Marshall Islands. They interviewed a native woman who watched the Japanese bury Amelia.

I got a thank-you from "Unsolved Mysteries," but then they repeated the segment again this year with no additions. If I'd been the producer I'd have updated it. Of course, then it might not qualify as "Unsolved." Maybe I should wait for a new series on "Solved Mysteries." Oh well, at least it gives me (or you) something to talk about on the air. . . if anyone ever asks for more than a signal report. No one has yet. But heck, I've only been hamming for 53 years so far. I must learn to be more patient.

"Our gear is going to get more compact, more complex, and cheaper. And that has implications far beyond amateur radio, so we're going to see increased pressures to use our bands for business and personal communications."

Selling IBM Short?

Golly, if you'd only known that IBM's stock was going to plummet, you could have made a killing! How could anyone guess? Well, one way is by reading my editorials.

The cover story on a recent *Fortune* was on the bad news with this bluest of blue-chips, Big Blue. Funny thing about the long article (10 pages). . . no one, including the author and IBM management, apparently understands the fundamental reasons why IBM is sinking. The article, like those I've seen in the *WSJ* and other financial publications, dwells entirely on the symptoms. . . the immediate problems IBM's basic weakness has caused.

Why did I predict about seven years ago that IBM, DEC, Data General, Prime, and Wang were doomed? It doesn't take an astrophysicist to see where technology is headed. And once you understand that you can see why the handwriting is on the wall for the big computer companies.

The minicomputer was the first step. The mainframe computer companies sneered when DEC, Data General, Wang, and others started selling minicomputers. Toys. Well, they were selling computer power at about 10% of a mainframe's cost. Honeywell, G.E., and others ignored the minis and are history. IBM, with around 80% of the mainframe market, got hurt, but learned from the experience and eventually started making minis too.

Their big problem with minis was that they had to sell 10 times as many to make the same money. And they let a few competitors like DEC get too big before they figured out what was happening.

Then along came the microcomputer, selling the same (and higher) power at 10% the cost of the minicomputers. Toys! I had lunch with An Wang and tried to get him to understand what was going to happen. His blindness to micros was unchangeable, even though it was this same blindness by the big iron makers which he had exploited.

I tried to convince De Castro, the president of Data General. He got mad. I talked with the president and top management of Centronics, the largest maker of printers in the world. No soap. They're making pancake turners in the Centronics factory now.

IBM held back getting into micros until the government suit against them for their near monopolization of the mainframe computer business was settled. Then they jumped in. Alas, even if they'd been able to control 80% of the micro market (they've got about 14%), they were still doomed as a company.

When micros appeared it was obvious that super-micros would be along. Now we're looking at micros with the power of mainframes, but at 1/100th the cost. Let's say that IBM gets into the super-micro business. With 80% of the market already in hand, how can they sell a hundred times as many super-micros to maintain their same revenues? Oh, a few more big companies will buy them, but not a hundred times as many.

Worse, technology is inevitably heading toward even faster and less expensive computers which will cost a tenth what the super-micros will cost. Just as the Radio Shack Model 100 laptop, which was introduced eight years ago, had more computing power than the largest computers in the world a few years earlier, we're looking at Cray Computer speeds and throughput for a few thousand dollars, not tens of millions.

And even worse, as the cost of computing and memory come down, smaller, faster-reacting firms can run circles around government-sized behemoths. With all due respect, while there may be some fairly bright people in top management (I say there may be. . . I haven't any personal experience to confirm this), the quality of people at lower levels is often heartbreaking. Thus, entrepreneurs can run the big companies ragged with more innovative products and lower prices.

The microcomputer industry grew quickly, feeding on the complacency of the minicomputer firms. Indeed, it grew at a fairly steady rate of 235% per year for its first eight years. Not bad, eh? When all that started I recommended getting into the business.

By 1981 Radio Shack had 40% of the micro market, Apple had 40%, and around 300 other smaller firms shared 20%. Then IBM came in, with an old buddy of mine, Chaz Cone W4GKF, calling many of the shots. They did well for a while, but eventually faster-moving entrepreneurs took more and more market share away from them.

IBM is firing thousands of people, but you seldom can save a business by economizing. More often you have to sell your way out of trouble. . . and there isn't enough of a market in the whole world to support IBM at its present size once their big iron has been made obsolete.

Hmph, I hear you grumble, so what's all this horn-tooting by Doc Green got to do with amateur radio? Plenty. It may have escaped you that today's transceivers are packed with computer chips. Synthesizers, memories, packet, RTTY, and so on are all made possible by these chips. The faster and more complex they get, the lower the cost of advanced communications technology. What I'm saying, translated into ham language, is that you ain't seen nothin' yet! Our gear is going to get more compact, more complex, and cheaper. And that has implications far beyond amateur radio, so we're going to see increased pressures to use our bands for business and personal communications.

Oh, I get pathetic letters from oldtimers who are in sticker shock over the cost of today's radio gear. Apparently they haven't noticed what 40 years of inflation has done to prices. Today's radio gear is an incredible bargain compared to the prehistoric stuff we used to buy for 10 times the price (and more) a few years ago.

As ICs get more and more crammed into them, we're going to be able to do things not even imagined today . . . and in just a few years. Super-micros and megabyte memory chips are going to change things. Packet, RTTY, high speed CW, SSB, and so on, all in an HT, complete with a small keyboard? Yup. It's coming. The question is, now that you know, are you going to take advantage of this and ride the crest of the wave or are you going to flounder around. . . or, like IBM, get crushed as the wave sweeps over? 73

HOMING IN

Radio Direction Finding

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Foxhunters Invade Oregon

"As you are reading this, 10 Soviets are taking over Portland's Forest Park!" Everyone laughed as Kevin Hunt WA7VTD read these words from the podium at the opening ceremonies of the 1991 Friendship Radio Games (FRG-91).

The sentence came from a news release he had sent to local radio and TV stations to ensure that the Games would not be overlooked by the media. It was a tough sell, because on that day 99.9 percent of Portland sports fans cared only about seeing their beloved Trailblazers beat the Los Angeles Lakers in the NBA playoff series.

But roundball players aren't the only trailblazers in Portland. The hams of that area are pioneers at fostering international goodwill through their hobby. Two years ago, several of them went to Khabarovsk, USSR, for the first Sister Cities Radiosport Games (see the June 1991 "Homing In").

This year is Portland's turn to put on the Olympics of ham radio, and they pulled it off with style. FRG-91 included the first sanctioned international radio direction finding (RDF) competition on U.S. soil.

World-class T-hunters from Southern California, New Mexico, and Washington were invited. They faced a team of championship foxhunters from Japan, and two teams from the Soviet Union. WA6OPS and I were there to serve on the judging team and to cover the games for *73 Amateur Radio Today*.

Radiosporting Goods

There are many obstacles to face in putting on an international "foxhunt," as these RDF competitions are called. One tricky chore is selecting and providing RDF gear. To ensure fairness, all competitors should use the same type of equipment. All sets should give uniform performance.

On-foot competitive RDF methods for 2 meters vary greatly from country to country. At home, the Soviets use simple tuned-radio-frequency (TRF) receivers and 3-element yagis. Even if they could have brought these simple receivers with them, the sets lack enough selectivity to perform properly in the crowded band conditions of a typical U.S. city.

In Japan, commercial foxhunt receiver/antenna units are popular. These gadgets feature a synthesized receiver built into the boom of a 2-element phased array (see Photo A). Electronic attenuation and audible strength indication are included. The Japanese 2 meter band is only 144–146 MHz, so their fox-trackers won't work on the popular USA foxhunt frequencies above 146 MHz without modification.

There is no "standard" RDF set for North American foxhunters. The L-Per by L-Tronics is popular with search/rescue folks who hunt aircraft ELTs, but its 4-channel, crystal-controlled receiver limits its usefulness on 2 meters. Dual-antenna time-difference-of-arrival (TDOA) sets are often seen because they work with stock handheld FM transceivers. (See "Homing In" for September and November 1989.) However, they lack any indication of signal strength to help gauge distance to the fox.

Photo B. "So it's this way, right?" Igor Krivosheev UWØCZ learns how to use a SuperDF before the FRG-91 foxhunt. Igor teaches radio and orienteering to pre-teens in Khabarovsk.

One tricky chore is selecting and providing RDF gear. To ensure fairness, all competitors should use the same type of equipment.

After much discussion, the FARS foxhunt committee decided that all competitors would use SuperDFs. These dual-antenna TDOA sets are manufactured by BMG Engineering of Temple City, California. Owner Russ Andrews K6BMG provided 16 antenna sets and DF display units (Photo B) in kit form to FARS a few weeks before the date of the competition. One of the "big three" ham manufacturers provided pocket-sized hand-helds for use with the SuperDFs.

Building 16 RDF sets in a short time—what a task! But Portland's hams were up to it. When I arrived the night before the FRG-91 foxhunt "dry run," a houseful of them were tweaking up the SuperDFs and bolting on the cases, in between glances at the Blazers on TV.

On the morning of 29 May, all hands gathered in giant Forest Park to test the fox transmitters and RDF sets. It was the competitors' first and only chance to learn how to use the gear before the official competition the following day. It rained, of course.

Despite the bad weather, everyone was excited and eager to seek out the five fraction-watt transmitters that had been scattered on the 200-acre course by Dick Fredrickson WAØDIM and Mike Holgate N7OKJ.

The rain didn't hurt the transmitters, RDF sets or receivers. But Murphy had a more serious problem in store.

Killer Cross-Mod

All the fox transmitters' MCW signals were loud and clear through the SuperDF dual antennas with the DF sets powered down. But the fox tones immediately disappeared into the noise when the SuperDF control units were turned on, starting the electronic switching of the dual whips.

Some loss of sensitivity due to commutation of antennas is normal in a TDOA RDF set. But this time it was worse than anyone had ever seen before. The miniature hand-helds were useless.

Full-sized hand-helds with wideband front ends worked better. Older sets with narrow RF stages were best. My old Tempo S1 worked fine!

There are three tall towers near Forest Park with VHF communications, broadcasting, and paging antennas. The presence of strong RF fields causes cross-modulation products to be generated when antennas are switched at an audio rate, as is done in a TDOA RDF set.

Continued on page 93

Photo A. Champion foxhunter Yoshiko Yamagami JQ1LCW shows a popular Japanese RDF device to Kevin Kelly N6QAB, winner of the FRG-91 individual foxhunt gold medal.

Photo C. Gene Shulgin UZ3AU, Technical Editor of Radio Magazine *in the USSR, pitched in during the late-night tune-up/repair session.*

RANDOM OUTPUT

David Cassidy N1GPH

Colin's Visit

My six-year-old nephew, Colin, came to visit a few weeks ago. He and his mom came up to "the country" from "the big city," for a little fresh air.

We took him to the town fair, which just happened to fall on that weekend. We pointed out all kinds of neat things he doesn't get to see in the city: the deer on the side of the road at dusk, the ground hogs that have a perpetual fascination with our back yard, and the lightning bugs that fill up the yard on a summer evening and mimic the starry sky that glows down from above.

On Sunday morning, Colin reminded me that I had promised to show him my radios. His mom had told me that he was very excited to hear and talk to people from other countries. He and I trotted off to my shack, powered up and sat down behind the HF rig. The concentration on this little guy's face was amazing. He knew that he was entering Uncle David's special room, and he was making sure he was on his best behavior so that I would invite him back.

As we scanned the bands, looking for foreign sounding voices, it soon became apparent that we were experiencing one of those solar flare band wipe-outs that are common in the summer. 10 meters... dead. 15...ditto. I tuned up and down 20 meters, figuring that the DX chasers wouldn't let me down. They did. 40 meters at least offered some signals coming through, but the farthest we could hear was Pennsylvania—not exactly the geographic tour my nephew was hoping for.

So...there I was...sitting next to a six-year-old with the chance to instill in him a love of radio and the darned ionosphere was ruining everything. I could see Colin's interest beginning to wane. Then he asked me "What's that?" and pointed to the code key, which in my shack is usually pushed to the back of the desk and covered with a pretty good accumulation of dust. I explained to him about Morse code, turned the antenna switch to the dummy load and started sending. I sent C-O-L-I-N and told him that was his name in code. Colin's face lit up!

I wrote the dots and dashes under the letters on a piece of paper and explained how to say "dah-dit" instead of "dot-dash." When I asked him if he would like to try it he almost ripped the key out of the rig. His six-year-old fingers took a few minutes to get the hang of it, but after two or three tries he was sending fairly copyable code.

Colin's mom was called immediately to the shack, to witness Colin's newfound skill. He sent his name. Then he sent "hi mom." Mom was suitably impressed. We spent the rest of the morning figuring out short words and simple sentences. The rhythm of "CQ" was a little difficult, but he seemed fascinated by it and eventually mastered it.

After a while, we tried an actual contact. I called a quick "CQ" in the Novice portion of 40 meters and was answered by a weak signal in Virginia. Colin stared at my hand as the sound coming out of the speaker was instantly transferred to letters on the yellow pad. Every time he heard one of the letters he recognized, he shouted it out–"It S! C! H!" He had a lot of questions about some of the funny looking "words" like QTH, RST, ES, OM, etc. I missed some stuff being sent because I wanted to explain as he asked the question. So what! It was your standard "name, QTH, RST" QSO, and everything was sent twice, so I didn't miss all that much. The signal faded and I caught a final "73" before it disappeared altogether. Colin and I sat at my operating desk and went over the text. He liked the idea of having so many "code" words like QSL and RST.

I let him send some more into the dummy load and taught him a few more letters.

"I sent C-O-L-I-N and told him that was his name in code. Colin's face lit up!"

When it was time to go, he grabbed the piece of paper that had the dots and dashes on it and took it with him.

Colin did me a great favor. He reminded me that Morse code—with the prejudice and pressure removed—can still be an exciting way to turn on a young mind to amateur radio. I had forgotten that. Anyone who is afraid that the code will eventually pass away only has to look at the face of a six-year-old as he learns how to say his name in this "foreign" language.

A six-year-old's attention span can often be measured in minutes, or at best, hours. Sometimes a task or subject will be so interesting that it is maintained over several days, until it is replaced by something else equally new and fascinating. Without reenforcement every few days, I figured Colin would find something else to occupy his inquisitive mind and active imagination. Sure, when he got home he showed his dad how to send a few words in Morse code (or, as he calls it, Morris code), but I knew he'd soon be off to other interests.

Colin's visit was several weeks ago. Today I received a birthday card from him, his mom, and dad. On the left-hand side of the card, in the steadiest hand a six-year-old can muster, was written,

"•—•• ——— •••— •
—•—• ——— •—•• •• —•"

Thank you, Colin.

•• •—•• ——— •••— •
—•—— ——— ••—
— ——— ———

PROPAGATION

Jim Gray W1XU

Jim Gray W1XU
210 E. Chateau Circle
Payson AZ 85541

Some of our readers have expressed an appreciation for this column, and N2FZ has told me how helpful it is to him...in fact, he clips it out each month and posts it in the shack for reference. I'd like to hear from you readers who enjoy the column, and especially those of you who have comments, pro and con, about what you like and don't like, and how you think it can be improved. Also, I'd like for you to rate it for accuracy—a batting average, if you will. We all like to know how we're doing once in a while.

One last item before we go to this month's forecast: Please get a copy of the March 1990 *Smithsonian* magazine and refer to the article, "Do Solar Fireworks Bring Stormy Weather?" on page 32. Author Stephen P. Moran gives us a look at the sun and its behavior, and I find the article one of the best I have read on the sun and its influence on radio communications and other aspects of our environment. The photographs and charts alone are worth looking at, while the text is fascinating.

Similar But Not the Same

Conditions for September, October, and November will be similar to conditions last March, April, and May. Spring and fall equinoxes exhibit the same number of hours of daylight and darkness, and as the days progress past the equinox, HF communications deteriorate slightly on the higher frequency bands and improve slightly on the lower frequency bands.

For September, you may look for POOR conditions between the 1st and 3rd, and again between the 20th and 22nd, and finally between the 27th and 29th. "Poor" means that DX paths through the auroral zones are difficult due to active minor (or even major) storm levels in earth's magnetic field. "Fair" means some paths are open while others may be closed, and "Good" means that worldwide DX is probable on those days of the month so marked in the chart.

It is always desirable to check WWV broadcasts at 18 minutes past any hour for their "Solar and Terrestrial Indices" numbers. You want high solar flux (above 180), low Boulder A index (below 10), and low Boulder K index (2 or below) for best propagation conditions via the ionosphere to either short- or long-skip locations.

In September, static levels will decline as Northern Hemisphere thunderstorms subside, and DX on the 40, 80, and 160 meter bands will improve dramatically as the winter months approach. However, the shorter daylight hours mean that the HF bands at 20 meters and above will close earlier, at dark or slightly thereafter, with the 10 and 12 meter bands dropping out first, followed by the 15, 17, and 20 meter bands. Good hunting!

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	—	—	—	—	—	20	20	—	—	—	—	15,17
ARGENTINA	15,17	15,17	20	20	—	—	—	—	—	15	15	15
AUSTRALIA	15,17	15,17	—	20	20	—	15,16	20	—	—	—	—
CANAL ZONE	20	20	20	20	20	20	20	20	15,17	15,17	15,17	15,17
ENGLAND	20	20	20,16	—	—	—	—	—	15,17	15,17	—	15,17	20
HAWAII	15,17	15,17	20	20	20	20	20	—	—	—	—	15,17
INDIA	20	20	—	20	20	—	—	—	—	—	—	15,17
JAPAN	—	—	—	—	—	20	20	—	—	—	—	15,17
MEXICO	20	20	20	20	20	20	20	15,17	15,17	15,17	15,17	15,17
PHILIPPINES	—	—	20	—	—	20	20	15,17	15,17	—	—	—
PUERTO RICO	20	20	20	20	20	20	20	15,17	15,17	15,17	15,17	15,17
SOUTH AFRICA	—	40	20	20	20	—	—	15,17	15,17	20	—	—
U.S.S.R.	20	20,16	20,16	—	—	—	—	—	—	15,17	15,17	20
WEST COAST	15,17	15,17	40,16	40,16	40	40	40	—	20	15,17	15,17	15,17

CENTRAL UNITED STATES TO:

ALASKA	15,17	—	—	—	—	20	20	20	—	—	—	15,17
ARGENTINA	15,17	15,17	20	—	—	20	—	—	—	—	15,17	15,17
AUSTRALIA	15,17	15,17	—	20	20	—	20	—	—	—	15,17	15,17
CANAL ZONE	15,17	20	20	20	—	20	20	15,17	15,17	15,17	15,17	15,17
ENGLAND	20	20	—	—	—	20	—	—	—	—	15,17	15,17
HAWAII	—	—	20	20	20,16	—	20	—	15,17	15,17	15,17	15,17
INDIA	15,17	20	—	—	—	20	20	—	—	—	—	15,17
JAPAN	15,17	—	—	—	—	20	20	20	—	—	—	15,17
MEXICO	15,17	20	20	20	—	20	20	15,17	15,17	15,17	15,17	15,17
PHILIPPINES	15,17	—	20	—	—	—	20	20	—	—	—	—
PUERTO RICO	15,17	20	20	20	—	20	20	20	15,17	15,17	15,17	15,17
SOUTH AFRICA	—	—	20,16	20	—	—	—	15,17	15,17	20	—	—
U.S.S.R.	20	20	20	20	—	20	—	—	15,17	15,17	15,17	20

WESTERN UNITED STATES TO:

ALASKA	15,17	20	20	20	20	20	—	20	15,17	15,17	15,17	15,17
ARGENTINA	15,17	15,17	15,17	20	20	—	—	—	—	—	15,17	15,17
AUSTRALIA	15,17	15,17	15,17	20	20	20,16	20,16	20	—	—	—	15,17
CANAL ZONE	15,17	15,17	20	20	20	—	—	—	—	15,17	15,17	15,17
ENGLAND	20	20	20	20	—	20	—	15,17	15,17	—	—	20
HAWAII	15,17	15,17	20	20	40	40	20	20	—	15,17	15,17	15,17
INDIA	—	15,17	15,17	—	—	—	20	20	15,17	15,17	—	—
JAPAN	15,17	20	20	20	20	20	—	20	15,17	15,17	15,17	15,17
MEXICO	15,17	15,17	20	20	20	—	—	—	15,17	15,17	15,17	15,17
PHILIPPINES	—	15,17	15,17	—	—	20	20	20	15,17	—	—	—
PUERTO RICO	15,17	15,17	20	20	20	—	—	—	—	15,17	15,17	15,17
SOUTH AFRICA	—	—	20	—	—	—	20	15,17	15,17	—	—	—
U.S.S.R.	20	20	20	20	—	—	—	—	—	—	—	20
EAST COAST	15,17	15,17	40,16	40,16	40	40	40	—	20	15,17	15,17	15,17

Notes: (1) Possible but rare dual bands (10 or 12, 15 or 17, 20 or 40). Try where shown. The highest possible bands shown. Also try next lower band at times shown.

SEPTEMBER 1991

SUN	MON	TUE	WED	THU	FRI	SAT
1 P	2 P	3 P–F	4 F	5 F–G	6 G	7 G
8 G–F	9 F–G	10 G	11 G	12 G–F	13 F	14 F
15 F	16 F	17 F	18 F	19 F–P	20 P	21 P
22 P	23 P–F	24 F–P	25 F–P	26 F–P	27 P	28 P
29 P	30 P–F					

Continued from page 91

These cross-mod products are mostly out-of-band, so they are rejected by narrow receiver front ends. But the latest generation of tiny hand-helds leave no room for selective input circuitry. Furthermore, today's HTs are deliberately designed, as a feature, to be wideband. (Don't you like being able to eavesdrop from 130 to 174 MHz with yours?)

FARS organizers spent the remainder of Wednesday rounding up older narrowband hand-helds for the competitors, and checking them out. A few of the SuperDFs didn't work properly even on narrowband receivers, so John White K7RUN hosted a troubleshooting party at his home that night.

Mike McCarter KA7NOO, Gene Shulgin UZ3AU (see Photo C), and others helped me check over each SuperDF control unit and antenna set, and repair them as necessary. Soldering irons were flying as we hurried to correct reversed diodes, loose BNC connectors, and wrong-value capacitors. By 2 a.m., all units were repaired and tested, and it was time to get some sleep.

Big Day for USA

Except for some old batteries on the borrowed hand-helds, the RDF gear worked fine during the May 30 foxhunt. The five-transmitter course was about two miles in total length. Contestants were allowed a maximum of three hours to find the foxes, in order. Except for a five-minute rainshower, the weather was fine.

Experience with switched antenna RDF methods paid off for the USA. Every US entrant was able to find all five transmitters. Kevin Kelly N6QAB took the gold back to Albuquerque as fastest individual foxhunter. He completed the course in one hour and fourteen minutes.

The winning hunting team was "US-Red," made up of Mike McCarter KA7NOO, Lewis Osborn KC7MZ, and Ron Miller WB6JGV. All are members of the Northwest ELT Team of Vancouver, Washington. KA7NOO was second place individual hunter, and KC7MZ was third.

Second place team was "US-Blue," consisting of N6QAB and Southern California hunter J. Scott Bovitz N6MI. The Japanese team of Yoshiko Yamagami JQ1LCW, Zen-ichi Oba JN1JPX, and Tuk Tsukui JR1WYB took the bronze.

No hams on earth are more friendly or more interested in international goodwill than those in the Portland area. Despite the "Beat LA" signs in every store window (for the basketball tourney, not the foxhunt), they made everyone feel welcome and part of an important amateur radio event, with lots of promise for the future. You'll be reading more about FARS and international radiosporting in this column and elsewhere in *73 Amateur Radio Today*. 73

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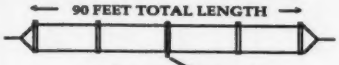

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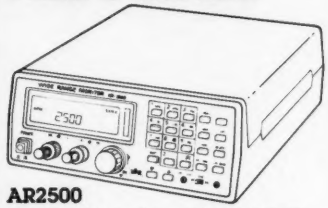

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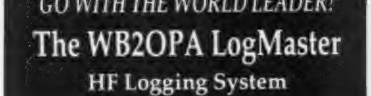

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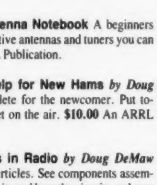

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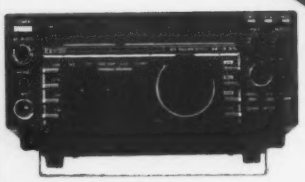

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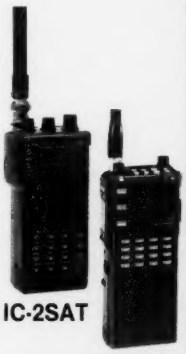

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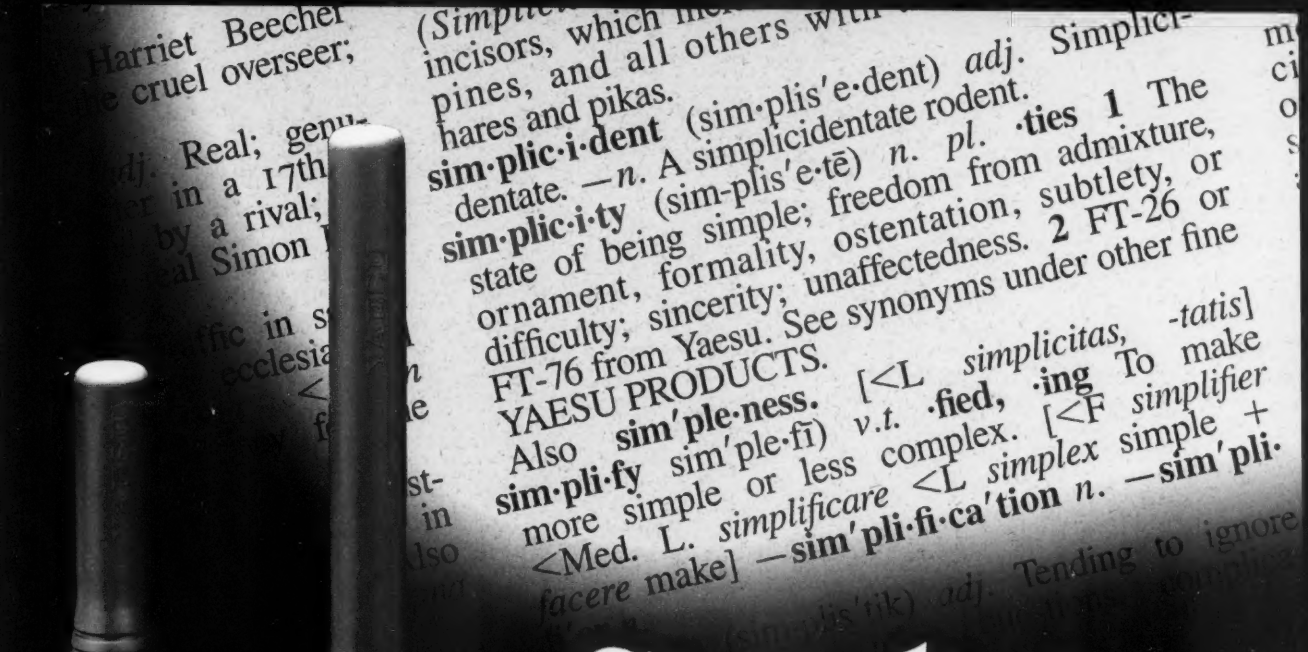
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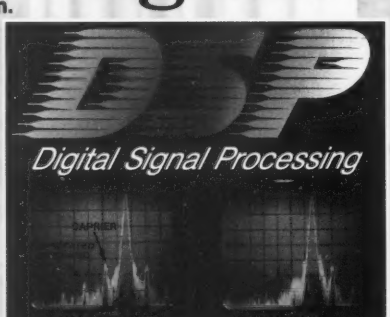

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